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Research Revolutionizes an Industry

PRIOR to 1913, something like 50 per cent of the nickel used went into armor plate, ordnance or some other military or naval equipment. When the war broke out the nickel producers bent every effort to the production of that metal for the suddenly multiplied needs of the combat forces and the percentage rose from 50 to a figure that is difficult to estimate. Then came the armistice, and the Disarmament Conference three years later. Consumption of nickel dropped to 7,500 tons for the world, and to 2,500 tons for the United States, about what it had been in the late nineties. For the nickel-producing companies production problems paled into insignificance before the marketing problems, the solution of which meant the difference between growth and decay. New uses for nickel had to be found. When R. C. Stanley became president of the International Nickel Company in 1922 one of his first actions was to institute a program of research and market development which has been continued ever since. The program included the further development of the uses to which nickel was already being put, and the discovery of new uses for nickel and of new nickel products that could be marketed.

Few industries have been harder hit by post-war changes than the nickel industry. Consumption decreased after the armistice to about what it had been thirty years before. Half of the market was practically eliminated. What the industry did was to turn to research, and with results indicating that the same recourse would benefit other ailing industries

In an address before the Canadian Institute of Mining and Metallurgy in 1926, Dr. Paul D. Merica, director of research, The International Nickel Company, stated the situation in this way:

"The majority of products into which nickel goes today are engineering materials. Engineering considerations prevail in the choice of such materials for the different commercial applications and engineers decide that choice. Competition is keen, not only in the sale by different producers of the same product but between products of different composition or type for the same purpose.

"The need, therefore, for competent research and engineering effort in promoting the industrial use of nickel products was recognized through the organization of a separate department of engineering development and research, in addition to the normal production and sales departments. This department maintains research laboratories and staff, the activities of which are directed toward the development of new uses of nickel and new nickel products. Laboratory investigations of engineering problems attending the use of nickel products, both new and old, are carried on and much of the information and data required for field development and sales work are there secured. The department maintains an engineering staff for the field work, familiar with the different fields in which the use of nickel products is being promoted and with the nickel-bearing materials used in these fields as well as their competitors. Broadly, therefore, it is the function of this department to secure the necessary engineering information on all nickel products, both new and old, either in laboratory or field and to bring that information to bear effectively upon every potential user. It provides much of this information in the form of special technical articles published by the technical societies and periodicals. Through field work, interviews and correspondence, it maintains contact with the engineers of industry, bringing our knowledge of nickel products directly to their aid in the solution of their problems, and keeping in touch, in turn, with their engineering and material requirements.

"Fruitful soil was at hand for this development work. There is no question that the war years exercised a very stimulating and invigorating effect upon engineering practice, design and construction, in consequence of

which old prejudices were destroyed and there was a quickened appreciation of the value of the newer and specialized materials—alloy steels and special alloys. Engineers are today more inclined to give favorable consideration to constructive changes in the use of materials."

One instance of the achievements of research in the bettering of a process in which nickel is an increasingly large factor is in the field of nickel plating. Nickel plating was discovered more than 80 years ago, yet it has remained an art until within the last few years. One progressive American company making a product that is plated to protect it from rust through exposure to the weather made a series of laboratory tests that showed that a coating of 0.001 in. of nickel gave a protection from rust approximately 80 times as effective as the traditional 0.0001 in. The product now remains rust-proof for 18 to 24 months where it formerly showed signs of rusting in a few weeks.

By reason of the improvement in the process of nickel plating, brought about through research, it is possible to deposit the heavier coating at practically no increase over the cost of the thin coat put in by the old method, a distinct advantage for the customer. At the same time the greatly increased use of nickel for plating has widened the market for the producer.

Through the use of proper materials and the accurate control of the plating methods, much higher current densities are being employed—thus keeping the labor cost from mounting. At the same time the surface imperfections are smoothed out in the heavier coating and less buffing is required. Because of this fact, and also because a heavier buffing pressure can be used, the costs in this department, the most expensive of all, are coming down. In one instance, daily output per man has increased from 40 to 1,000 pieces.

Among other achievements of product research have been many new applications of nickel steel, the development of alloy steels containing nickel and other metals as well, and nickel cast iron the characteristics of which were discussed in the *American Machinist,* Vol. 66, page 961. There has also been a large increase in the use of such copper-nickel alloys as Monel metal, Mond alloy and others, an increase that can be attributed largely to the efforts of the staffs of the International and other nickel-producing companies.

In conjunction with the product development work there has been the unremitting effort to improve production methods to the end that costs may be reduced and the market correspondingly broadened.

The melting of the ingredients of Monel metal was formerly done in open-hearth furnaces, which gave a satisfactory product if the materials were carefully selected and high in quality. When the big plant of the International Nickel Company at Huntington was built, 4-ton and 7-ton electric furnaces were installed for the same work. Their use was made possible through experiments in the old Bayonne laboratory with a 100-lb. electric furnace. With the electric furnace the product is uniformly high in quality even though the raw materials are not as good as they might be.

Huntington, W. Va., was selected as the site of the new plant because a large supply of sulphur-free natural gas was available for use in the annealing furnaces. The plant management is taking no chances, however. An experimental electric annealing furnace, 2x3x5ft., has been installed and operated to make sure that an alternative method can be adopted if anything happens to the gas supply.

One of the achievements credited to the plant research staff is the discovery that atmospheric control is vital to success in the heating and annealing of nickel alloys. A clean surface is maintained by keeping the atmosphere in the furnaces always of a reducing character.

The practical result of having these two forms of research going on side by side is that the company which faced a serious situation at the close of the war, through the loss of its principal market, is stronger now than then and enjoys a diversified commercial market for its product instead of a limited non-commercial one.

Men Over Fifty—*Discussion*

By C. J. Morrison

IT SEEMS that the statements made by S. C. Martin on p. 404, Vol. 69, of the *American Machinist,* should not go unchallenged. Objection is made to the man over fifty on account of the compensation for accidents, but rates for accident-insurance are not based upon age. In fact, the rates depend upon the payroll and the industry, age being no consideration.

By employee insurance, Mr. Martin presumably refers to group life insurance, and as age is the big factor in determining the rates for such insurance, a number of older men in an organization would, undoubtedly, increase the rate. This insurance, however, is not compulsory, and the older men can be excluded if such a step seems desirable.

A recent investigation of automobile accidents, made by the State of Connecticut, shows that the older drivers are less liable to have accidents than the younger ones, and that the number of accidents decreases as the age increases.

The railroads seem to have supreme confidence in the older men as is shown by the fact that the engineers on the crack trains are the older men, while the younger men are assigned to the slower-moving freight trains. Even though the eye and the hand may be less quick than in youth, other factors, particularly experience, compensate for this loss.

Mr. Martin states that the work done in years past has been paid for. Such is not the case if a man is to be discarded at fifty, unless his compensation has been sufficient to enable him to save enough so that he can spend the remainder of his days in peace and comfort. In fact, if all men are to be discarded at fifty, an entire new social order will have to be set up, and some means established to care for these men and their dependents. There are so many men over fifty that this would place a very heavy burden on the younger men. It does not seem that we have advanced to the point of killing everyone so unfortunate as to have had a fiftieth birthday.

Airplanes have evidently "arrived" as a means of transportation. They are now being sold on "time" payments.

General view of the Shop of the Hall Planetary Company

A Shop with Walls and Roof of Glass

By Fred H. Colvin
Editor, American Machinist

BEFORE deciding on the type of building for a new machine shop for the Hall Planetary Company, Philadelphia, many plans were considered and many plants in various parts of the country were visited. For about three years Mr. Hall studied the question of design and location for manufacturing a machine tool of the kind and size of his product, and for a shop that might be called fairly universal in its capacity. Industrial engineers and architects were consulted but proved of little help in working out a design that would be of maximum value to the manufacturer and of greatest comfort to the men. Health, elevation, surrondings, eyesight and other factors received careful consideration and eye specialists and surgeons were consulted. The kind of floors and of heating plants were studied, and the probable future of the locality received attention. The present location was finally chosen on account of its being high, away from heavy motor traffic with its carbon-monoxide gases, and beside a large city reservoir, in the belief that the city would not permit the location of factories having obnoxious odors in this viciniy. After careful consideration and against much advice, the construction shown in the headpiece was decided upon, which, however, gives no intimation that the entire walls and roof are of special actinic, corrugated-wire glass, and that all the exposed metal is copper, brass or lead. The company was particularly interested in the subject of proper lighting, both as to its effect on the eyes of the men and on the accuracy of the work. The results are that the men get about 80 per cent of the outside light at practically any point in the shop, because there are no dark corners. It has in fact, been found advisable to paint some parts of the glass with yellow linseed-oil paint. The glass in the walls, as high as the eaves, has been so painted, as shown in the headpiece. During the summer heat it is the practice to whitewash the roof on the outside so as to reflect the rays of the sun and prevent the air in the shop from becoming overheated. Experience indicates that the whitewashing is so effective that the temperature in the shop is approximately 6 deg. cooler than in any of the surrounding plants of usual construction, including a splendid example of a saw tooth construction in a new building which is not far away. Temperature tests indicated that it was advisable to introduce the heat next to the wall and have it forced toward

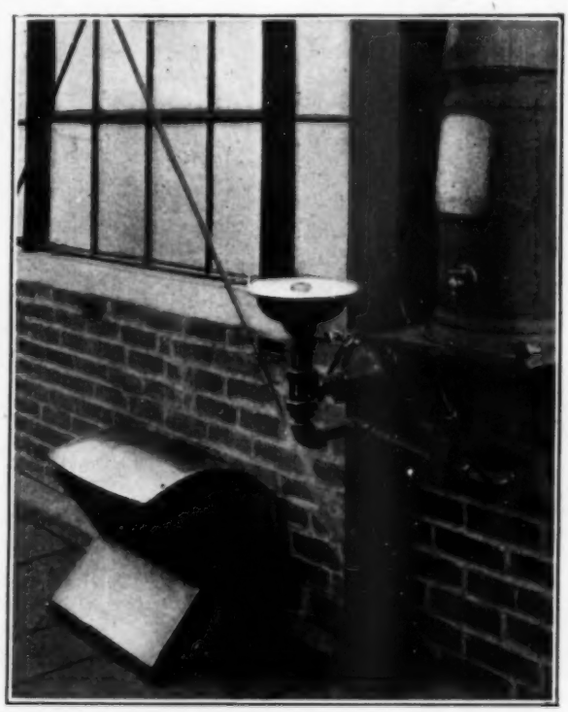


Fig. 1—Side wall, showing one of the hot air outlets and a drinking fountain. It will be noted that the fountain is clamped to the columns, this being the policy rather than to drill holes in any of the structural members

the center of the shop. The duct cuts the walls of the building loose from the shop floor and prevents the cold from penetrating from the foundation direct to the floor, which is of creosoted wooden blocks. One of the hot-air registers is shown in Fig. 1, the heat coming up from a hot-air duct and being distributed at intervals. Arrangements are also made so that fresh air can be pumped through the heating ducts to assist in securing uniform ventilation and air circulation.

The shop is 100x150 ft. and extra-heavy steel work was used, so that cross beams for supporting the countershafts and other mechanisms could be attached at any point, and could be moved at any time it was necessary to move the machines to which they were connected. The glass used is of standard-size 20x60 in. and is held in place by brass screws and lead washers that hold the panes with cemented joints. The building is 12 ft. high around the edges and 22 ft. high in the center.

One of the noticeable features is

Fig. 2—Another example of the method of avoiding holes in the structural members. Here the bracket for holding the fire bucket is held in position by two sharp-pointed set screws that are forced against the inside of the beam flanges. These screws enter the beam slightly

that all fixtures and appliances are clamped to the building columns and beams instead of holes being drilled and the parts bolted together. An example of this is shown in Fig. 1 where the drinking fountain and the electric-light outlets are both clamped to one of the columns. A similar example is shown on Fig. 2 where the fire bucket is held on a bracket that is fastened between the flanges of one of the columns by means of sharp-pointed setscrews at each end of the bracket.

The section of the shop in Fig. 3 shows how the countershafts are supported on channels and other structural members resting on the upper sides of the beams, and are clamped in position instead of being bolted as is usually done. More details of the overhead construction work are shown in Fig. 4, which is at one end of the shop where the overhead monorail makes a 90-deg. curve. Here too the monorail I-beam is held to the truss member by clamps instead of being riveted.

An excellent example of the way

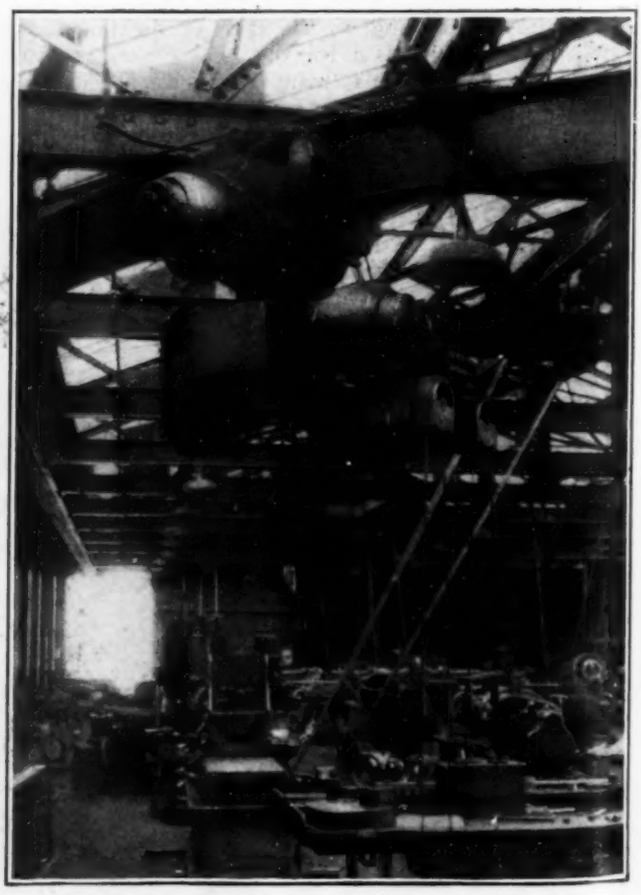


Fig. 3—Some of the overhead work of the shop, showing how the structural steel-work that supports the countershafts is located and held. These supports are all on the upper sides of the lower truss members, and are clamped in position instead of being bolted or riveted. Fig. 4—More of the overhead construction showing how the monorail I-beam is held to the truss member. This view also shows the overhead machinery over the truss members and how the monorail serves this end of the shop. The excellent distribution of light is also shown in both Figs. 3 and 4, for there are almost no shadows and the light comes from both the sides and from the entire roof

in which this type of shop construction permits the distribution of light is given in Fig. 5. The machine in the foreground is located quite a distance from the side wall so that its illumination comes entirely through the glass of the walls and roof. There are, as will be seen, very few shadows and a very even lighting of the machine. Under the side bay, or lean-to, shown at the extreme right of the headpiece are located the washroom and other accommodations. These rooms have excellent light, which is of itself a great aid to sanitation. Large circular wash-tanks of artificial stone are provided, these giving an ever-changing supply of fresh water to the worker.

After trying this plant for something over two years, the company is satisfied that no mistake was made in selecting this type of building for its particular needs. It is felt that, although the cost of this construction is 50 per cent higher than would have been necessary for a shop of this size of ordinary construction, the extremely low cost of maintenance and the effect of the cheerfulness on the men during the winter months has made a good investment.

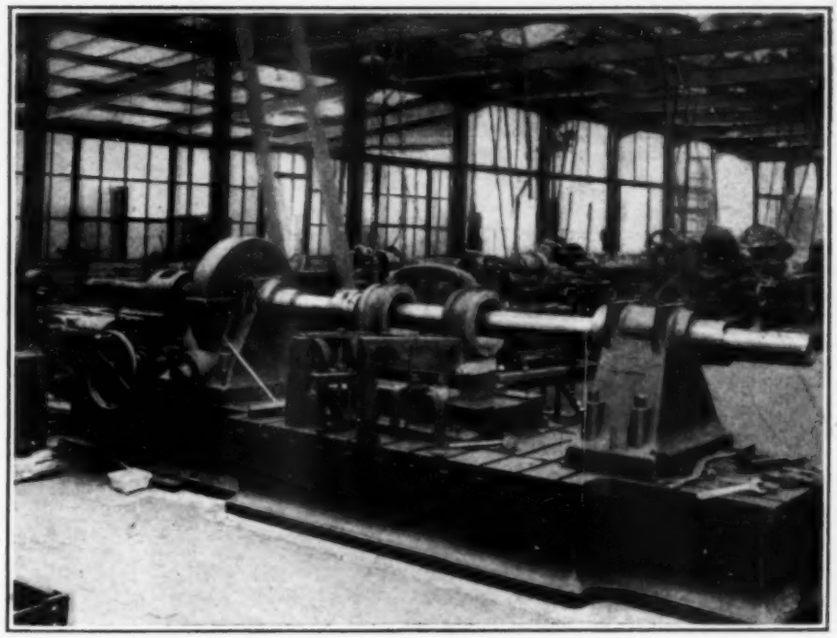


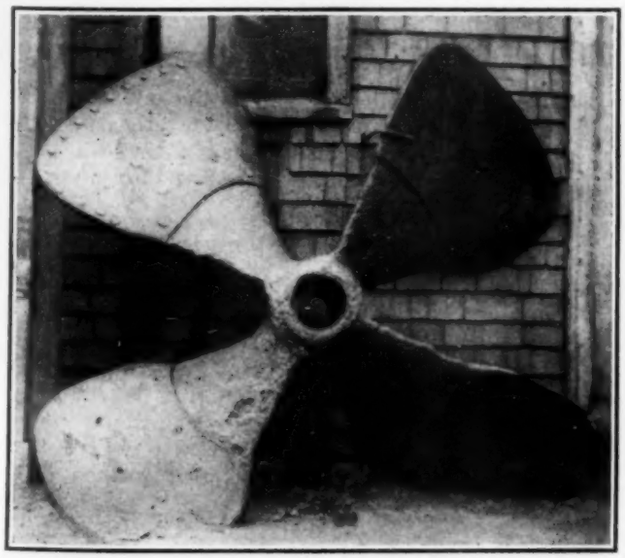
Fig. 5—An excellent example of the even distribution of light, owing to the use of glass in the walls and roof. The machine is boring a headstock of one of the Planetary machines to receive its spindle. The uniform light on this machine is typical of the whole shop

There are so few departures from standard or conventionalized designs in machine shop construction that radical changes, as depicted in this plant, should be welcomed by those who are not satisfied that perfection has been attained. And all shop managers with progressive tendencies and open minds welcome suggestions whereby machine shops may be made more pleasant, safer, and more healthful places in which to work.

Salvaging an Old Propeller

By Frank C. Hudson

TO SHOW the contrast between old and new methods of repairing propeller blades, the photograph was made outside the shop of T. Hogan & Company, Halifax, N. S., on a recent visit to that city. Although the exact date could not be ascertained, it was thought that the work must have been done twenty or more years ago, but the propeller apparently never went into service after the repairs were made. At present it acts as a sort of trademark on the outside of the building. Whoever made these repairs was a master workman in his craft, as it is no easy matter to shape boiler plate and fit it around the blades of an old propeller. The plates fitted the casting remarkably well, and were carefully rounded over on the leading edges, so as to cut the water as cleanly as possible.



An old propeller repaired before the days of welding

Grinding Wheel Standards Revision

ACCORDING to simplified Practice Recommendation R45-28, issued by the Bureau of Standards of the United States Department of Commerce, grinding wheel types 3, 8, 9, 10, and 14 are recommended for elimination, and efforts will be made to clear current orders and existing stocks of the eliminated sizes before January 1, 1929. The types of wheels eliminated from the accepted standards are: the tapered one side, the countersunk dovetail, the double cup, the raised dovetail, and the offset. All of the 14 types of wheels as previously adopted by the Simplified Practice Committee are shown on the Reference Book Sheet, No. 11, Tools and Dies, published on page 465, Vol. 65, of the *American Machinist*. Copies of this reference book sheet should be changed accordingly. When a re-issue of this sheet is made, it will conform to the new standards.

Planning the Plant Layout

THE Deere Manufacturing Company was building a new modern plant, and the construction was to a point where the firm was planning to move into the new quarters within a few months. Bert Williams, manager of a neighboring plant, was "kidding" old man Deere about the mess that he would soon be in. They were in the smoking room at the club, and Bill Holland was one of the party.

"It'll take you months to get settled—and then some," said Williams. "When we moved over to our new plant two years ago it took us six months before we got everybody half-way satisfied as to where they ought to be. We moved some of the departments two and three times, as well as making a number of shifts within the departments themselves."

"But didn't you have an engineer make a layout in the first place? That's what we're doing, and we'll get a real practical layout to go by in setting up the equipment."

"That's what you think! So did we! We had our engineering department spend a lot of time arranging departments and machinery on paper. They were supposed to consult with the foremen, too, but when it came to a show-down later, some of the foremen claimed that the engineers talked so hard in 'big efficiency' terms that their little arguments for plain, common-sense set-ups were lost in the shuffle."

"Guess that depends on what kind of men you have as engineers," answered Deere. "What do you think about it, Mr. Holland?"

"I've been listening with interest, gentlemen," spoke up our friend Bill Holland, "because I was talking over the same subject with a G.M. in Riverdale only last month. I think you're both partly right—and partly wrong. Bert, here, may be a little hard on the engineers, but I guess he isn't the only one who has had similar experiences."

"What did they do at Riverdale, Bill?" interrupted Williams.

"Well, the King typewriter people are just completing a new building, and due to the layout of their lot and other outside considerations they were limited to putting up a four-story building parallel to the others.

"Of course, the additional production space doesn't mean tacking on new departments. It necessitates adding space to every one of the present thirty departments, and will require a complete shifting about. So, the G.M. got out thirty sets of floor plans and passed them out to the foremen, with a request that they indicate on the drawings where they would like to be, and where they thought the other departments that they deal with ought to be in relation to their own.

"When he gets these plans back he will have the foremen's written preferences, with reasons, and then he's going to set the chief engineer, superintendent, and production supervisor on the job to straighten out the tangle."

"I'll say there'll be a tangle. Won't all the foremen want the space nearest the main entrance, so they can get out to lunch quick, Bill?" laughed Williams.

"No, I don't think so, Bert. I believe they will take it seriously from the production and transportation angles."

"I can afford to wait three months to see how they make out, Bill," answered Jim Deere. "Wonder if it isn't worth while?"

Executives are invited to discuss the problem involved in the foregoing case. They are also urged to use this department to air their own problems. A letter to the Executive Forum Editor is all that is needed.

Discussion

How Much Overhead?

Overhead expressed as a percentage of direct labor seldom pictures the situation in its true color. The executive who looks only at that factor is likely to make mistakes, and come to wrong conclusions. In fact, almost any other method

seems to be better. Where operations are performed chiefly by machines, the best method of figuring overhead is by the machine-hour rate. A machine-hour rate should include all expenses that are directly traceable to the machine, such as rent on space occupied, maintenance charges, and depreciation expense.

Such a method of figuring the cost of production, and the proper determination of overhead, involves more clerical work than the old method of using labor cost as the base, but it is accurate, and what is oftimes more important, it points out the best means for reducing the cost of production. The only real justification for the determination of the proper overhead, and for the compilation of costs, is defeated if production costs are not lowered as a result. —S. KUPPER.

Profits for Builder and User

A most equitable method of insuring fair profits for the builder, and a just price for the user of the machine, would be the employment of the lease system for high-production machines. By the use of this method the builder gets a percentage of the savings as long as the machine saves money for the user. This plan offers a means whereby the designer and builder of high-production machinery can receive fair remuneration for their efforts and ability. Furthermore, it gives the user the equal advantage of a fair and reasonable price, based on the value in dollars and cents, of the machine to him.

Therefore, it is advocated that when buyers balk at the price of machines, the machines should be installed without cost on a contract, the maker of the machine to receive a fixed percentage of the savings over a certain period. This will operate to the maker's and user's mutual benefit, and will assure both of receiving just and adequate returns. —JOSEPH BELL.

Making the Most of Floor Space

One reason why the efficient use of floor-space is not more often given careful study, is that so many plants have on their hands a fixed amount of space, part of which would stand idle if the balance were used with economy. The natural tendency is to arrange manufacturing equipment so as to fill all of the space available. When it becomes necessary to increase production, we jump to the natural conclusion that, since we are using all our present space, we must have additional space in order to secure additional output.

One of the biggest space-consumers in many plants is accumulated work in process. Plants which keep all their material moving continuously are able to pack their machines close together. Even a plant without a conveyor system can save floor space by good planning and scheduling.

Another big waster of space is poor illumination. In one plant, a check-up showed that three-quarters of the output was produced in one-half of the floor area—the portions of the floor-space adjacent to the windows. The other half of the space, cut off from the light by the belting, was taken up by reserve machines, odd-job machines, and partly-finished work, or was wasted in unnecessarily wide aisles. The reserve equipment consisted mostly of older machines that had been replaced by more modern types or by automatics, but which were being kept on the floor just because "something might happen, and the central part of the floor is too dark to work in, anyway." A small stock of spare parts for the automatics would make the reserve machines unnecessary, and attention to lighting would reclaim the dark spaces.

Problems of floor layout and machine arrangement are not always solved by the erection of new buildings. In our own newest reinforced-concrete building, each post is flared out into a mushroom top, with a square cap, to stiffen the floor above, with the result that we cannot hang any countershafts in a space seven feet square around each post, and there are plenty of posts.

—CHAS. S. HAZARD.

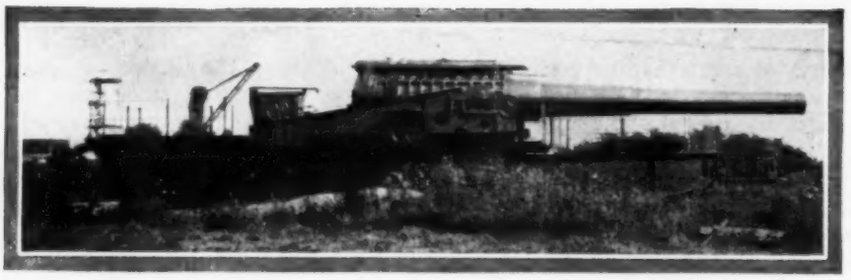
How Much Shall We "Doll Up" the Plant?

If the management of a plant is desirous of employing and retaining an intelligent class of help, it must try to fashion its factory buildings and grounds after the modern well-kept home. The buildings must be clean, well lighted, and have proper heating and ventilating systems installed throughout the entire plant. There must be sanitary washrooms, toilets, and drinking fountains, readily available at suitable locations throughout the plant.

If possible, the floors should be of hardwood on top of concrete so as to reduce dampness, and to relieve the leg muscles of the employees who are forced to maintain a standing position. Material should be piled neatly along the machines, or in available storage space in every department. All overhead shafting and belting should be eliminated if possible, and the walls and ceilings should be painted with a good grade of white paint, and should be cleaned as often as necessary to keep them in first-class condition.

A plant which is well laid out, and whose exterior walls are maintained in a clean condition, is always attractive to the passing traveler. The same applies to the condition of the grounds: Fine lawns of grass, trees, and flowers, properly landscaped, are sure to attract attention. If the factory happens to be situated along a well-traveled highway or railroad, it is bound to add to its advertising advantages.

—FRED. AUG. SCHMIDT.



Training Industrial Executives in Ordnance Field Work

The emergency of 1917 brought out clearly to the machinery builders at that time the realization that the manufacture of ordnance was not simply a matter of concern for one government department, but a vital problem for every metal-working plant in the country. To keep this thought of responsibility before industry the Ordnance Department operates an annual encampment of two weeks duration for the field training of Ordnance reserve officers.

For the 1928 summer training at Aberdeen Proving Grounds, Md., 150 men were picked from manufacturing plants in all parts of the country. These men included many of the higher executives and key men of machine shops, automotive plants, railroads, steel mills, and other industries. Included also was one of the editors of the *American Machinist*, and one of the secretaries of the A.S.M.E. They were given first-hand practical training on all ordnance materiel from the pistol to the 14-in. railway gun. Lecture courses by competent instructors were also held on the various types of ammunition, instruments, and methods of testing ordnance. The idea of the training is that these men will carry back into industry a knowledge of the mechanical requirements of a modern army in the field.

The reserve officers were arranged in groups of 10 to 12 for practical field work. In Fig. 1 is shown a group being instructed in the firing of the Stokes' mortar. Each man was given range practice with the pistol, rifle, and machine gun. Fig. 2 shows the Browning machine gun. The bombing plane shown in Fig. 3 was employed for flight instruction

Fig. 4—One day was spent at Fort Leonard Wood in studying the operation of the mechanized forces. Loading a 75-mm tractor mount on a truck by its own power

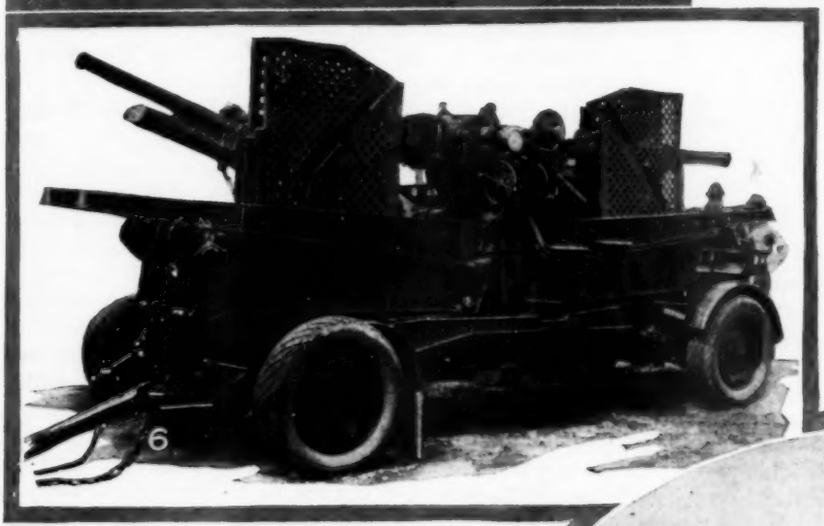


Fig. 5—A class of practical instruction in the mechanism of the latest 105 mm anti-aircraft gun. This gun has a range of 24,000 yd. Fig. 6—One of the newer types of anti-aircraft guns with the mechanized field forces

Fig. 7—One of the heavier British-type of tank. Instruction was given in various types of tanks in actual field operation, as well as a lecture course on tanks, tractors, and motorized equipment. Fig. 8—A 16-in. seacoast gun mount. The practical work on field and army guns included instruction on the field in testing and ballistics

The whole field course was supplemented by 1½ hours of company drill each day, and all men were required to wear the regulation uniform and comply with the requirements of barracks life during the two weeks. In addition to the course at Aberdeen Proving Ground, the Ordnance Department also operated courses in ordnance manufacturing methods at various arsenals for the benefit of reserve officers

· BOOK · REVIEWS ·

PRACTICAL COLOR SIMPLIFIED. By William J. Miskella, M.E. One hundred and thirteen pages, 6x9 in. Illustrated by charts, line drawings and several plates in full color. Cloth boards. Published by Finishing Research Laboratories, Inc., Chicago.

IN THIS age of color any book giving practical information on such subjects as color harmony, color mixing, matching pigments, etc., should find a ready welcome. This little volume contains some superfluous matter, but also much that should be of real help to the practical man who must learn something of color to keep up with the times.

The three color charts in the back of the book, on color choosing, complementary mixing, and mixed harmony and lighting, respectively, should prove particularly useful to the man faced with the problem of selecting a color scheme, especially if he be one of those who knows what he likes but is not so sure that his likes are generally shared by others.

DE RE METALLICA. By Georg Agricola. Translated from the original Latin into Modern German by Carl Schiffner, assisted by Ernst Darmstaedter, Paul Knauth, Wilhelm Pieper, Friedrich Schumacher, Victor Tafel, Emil Triptow, Erich Wandhoff. Five hundred and sixty-four pages, 8½x13 in. Lavishly illustrated with reproductions of the original woodcuts. Published by the Agricola Gesellschaft beim Deutschen Museum and sold through the VDI—Verlag, G.M.B.H., Berlin. Price: In full parchment, 75 renten marks; in half parchment, 45 renten marks.

IN THE introduction to the English translation of this monumental 16th century work, made by Herbert Clark Hoover and Lou Henry Hoover during a period of five years, and published by *The Mining Magazine*, in London, in 1912, surprise is expressed that there has never been a respectable translation of Agricola's masterpiece from the Latin in which he chose to write into his native German. The present volume is apparently an answer to that challenge, and seems to be exceedingly well done.

For those who never heard of Georg Agricola, or Bauer as he was born, it will be sufficient to say that he was a German philosopher, savant and public man, who was born in 1494 and died 62 years later. He is believed to have spent some 25 years in the preparation of this book which was published, by Froben in Basel, the year after his death.

According to the Hoover foreword, Agricola's book is the first treatise on mining and metallurgy ever written and was the only one for some 200 years later. Much of the practice is not original with him but represents the accumulated skill of the miners among whom he lived in the mountainous mining district of Saxony.

The work is in twelve books or divisions each dealing with a separate phase of mining or metallurgy. In the words of Agricola, "Of these, the first book contains the arguments which may be used against this art, and against metals and the mines, and what can be said in their favor. The second book describes the miner, and branches into a discourse on the finding of veins. The third book deals with veins and stringers, and seams in the rocks. The fourth book explains the method of delimiting veins, and also describes the functions of the mining officials. The fifth book describes the digging of ore and the surveyor's art. The sixth book describes the miner's tools and machines. The seventh book is on the assaying of ore. The eighth book lays down the rules for the work of roasting, crushing and washing the ore. The ninth book explains the methods of smelting ores. The tenth book instructs those who are studious of the metallic arts in the work of separating silver from gold, and lead from gold and silver. The eleventh book shows the way of separating silver from copper. The twelfth book gives us rules for manufacturing salt, soda, alum, vitriol, sulphur, bitumen, and glass."

ECONOMICS OF CONSUMPTION—By Warren C. Waite, associate professor of agricultural economics, University of Minnesota. Two hundred and sixty-three 9x6-in. pages, indexed, and 61 tables. Cloth covers. Published by the McGraw-Hill Book Company, New York City. Price $3.

POORLY ordered consumption results not only in loss of satisfaction and enjoyment on the part of the consumer, but causes a person to be less vigorous and intelligent than one employing the principles of economics in his purchasing. Recognizing this fact, the author has drawn upon scattered sources throughout the general literature on economics and consolidated his findings with his own discussions of certain phases into a related whole, whose principles are of value to the household economist and the market economist as well. It is his aim to show that consumption is not entirely an individual matter, but has important social aspects as well.

Consumption may be studied either in terms of prices, or of goods and services, or in psychic states. Unfortunately, price alone will not tell us all we wish to know. Therefore, considerations of human welfare in Part I are presented in five chapters which deal with: The organization of the economic order; incomes; price changes; cost of living, and protection of the consumer. The problem of the manner in which goods are chosen and the economic results of these choices are given in Part II, containing six chapters on: Choice of goods; elasticity of demand; family expenditures; variations in consumption; manipulation of demand, and purchasing habits. Part III, in four chapters, is concerned with the administration of the individual income. The phases taken up are: control of individual expenditures; tests of correct expenditures; insurance and investment, and the problem of purchasing. Finally, the problem of the relation of human welfare to wealth is presented. Part IV in four chapters deals with: the population problem; national problems of consumption; consumer's co-operation, and critique of consumption.

THE USE OF ABRASIVE WHEELS. Safety Pamphlet No. 7, issued by the Home Office Industrial Museum, London, and obtainable from The British Library of Information, 5 East 45th St., New York, N. Y., at a price of 20 cents. This 42-page, 6x9⅝-in. pamphlet is a concise and thorough treatise on the efficient use of abrasive wheels. It gives a short description of abrasives and the methods of manufacture of wheels, and then takes up the various aspects of safety precautions. It deals with the proper storing, mounting, operating, and guarding of wheels. The booklet contains 32 illustrations.

German and Skoda Tolerances Compared

By Dr. George Schlesinger
Professor at the Technological Institute, Charlottenburg, Berlin

DR. N. N. SAWIN, research engineer for the Skoda Works at Pilsen, Czechoslovakia, on page 721, Vol. 67, of the *American Machinist*, asserted in substance that the D.I.N. (*Deutsche Industrie Normen*, German Industrial Standard) system did not prove satisfactory in the Skoda works, and for that reason, after a thoroughly practical investigation, he established a system of his own which avoids all the shortcomings of the German system. In many cases it was impossible with the D.I.N. system to manufacture machine parts in an interchangeable manner. The shop often got push fits instead of the light drive fits desired, and similar complaints were made against wringing fits. Other fits did not meet the requirements of interchangeable construction either.

According to Sawin, the alleged failure of the German system in the Skoda works is based on the fundamentally wrong construction of the D.I.N. system in which the tolerances follow the simple mathematical principle: 1 tolerance unit $= 0.005 \sqrt[3]{D}$, where D is the diameter in millimeters. The size of the tolerances actually required in practice, says Sawin, does not follow any definite law at all, and at any rate not so simple a law. The correct tolerances for each diameter range have to be specially determined by reflection and experiment. The systematically laid down tolerances of the

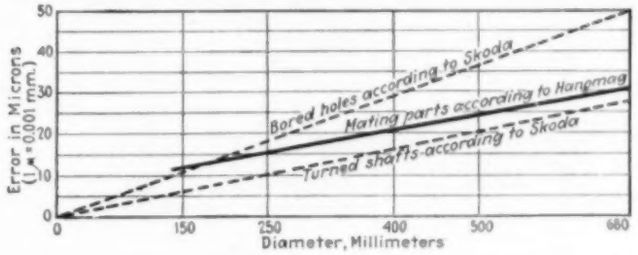
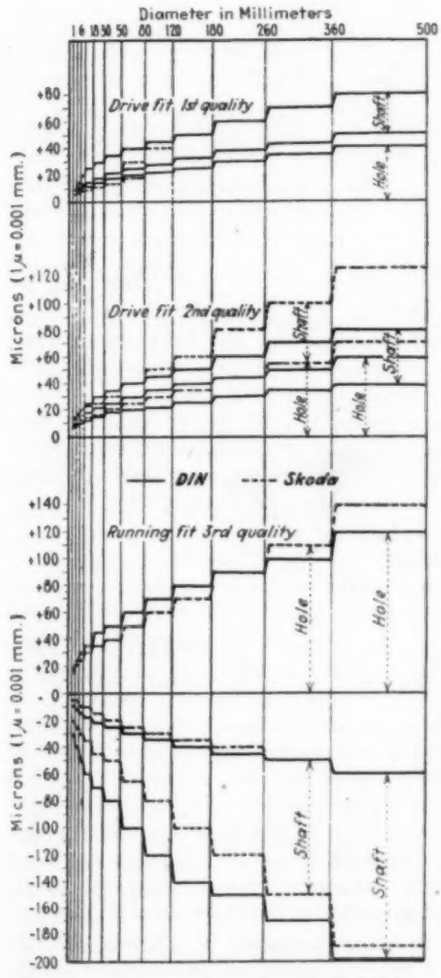

Error in Microns (1 μ = 0.001 mm.)
Bored holes according to Skoda
Mating parts according to Hanomag
Turned shafts according to Skoda
Diameter, Millimeters

Fig. 1—Errors from the circular shape as found in the experience of Skoda and the Hanomag



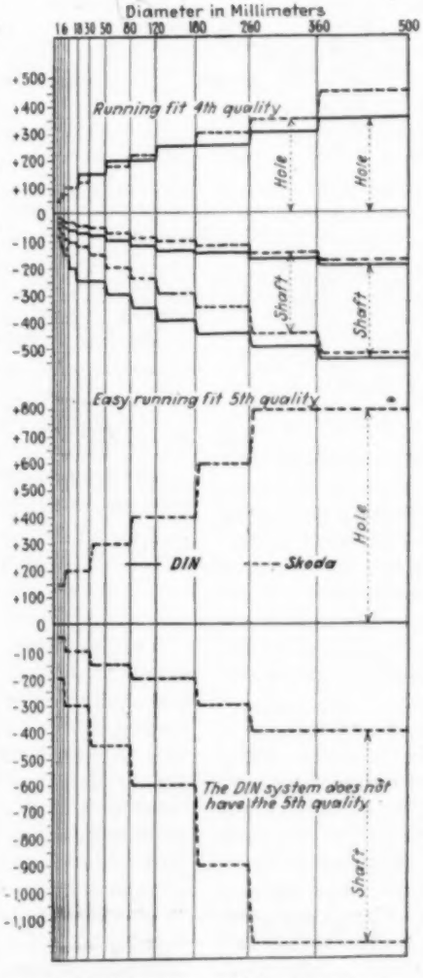


Fig. 2—A comparison of typical D.I.N. and Skoda tolerances based on the standard hole, one qualtiy of fit being taken from each class

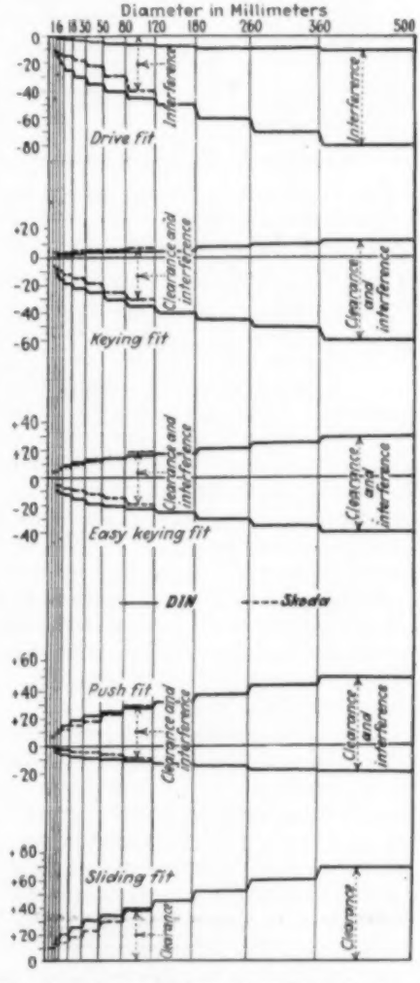


Fig. 3—A comparison of typical clearances and interferences of first quality

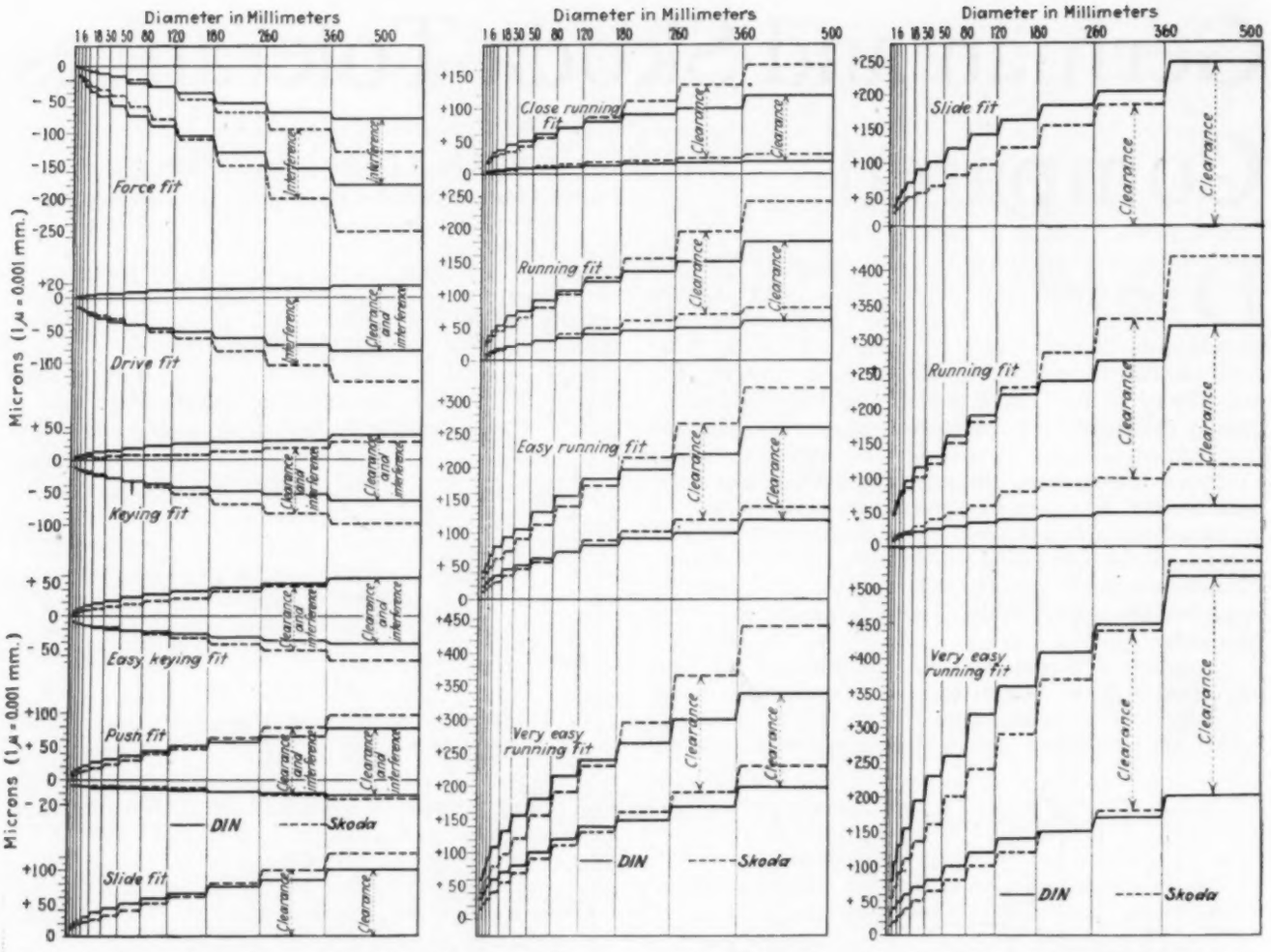


Fig. 4—Comparison of second quality clearances and interferences. Skoda tolerances are smaller than the D.I.N. for small diameters and larger for the large diameters, this being one of the marked differences between the systems

Fig. 5—D.I.N. clearances of the third quality compared with Skoda third quality clearances

D.I.N. system, according to Sawin, are too rough within the range of the small diameters and too fine within the range of the large diameters.

Another fault of the D.I.N. system is supposed to be that it graduated the characteristics of the fits proportional to $\sqrt[3]{D}$. The right basis is a graduation proportional to $\sqrt[5]{D}$, and this foundation was being used in the Skoda system. In conjunction with the allegedly poor graduation, and the above mentioned structure of the tolerances, the fits of the D.I.N. system are not supposed to be sufficiently sure of hitting the mark.

Fnally, the D.I.N. system is supposed to lack a press fit. This criticism can be removed at once, since the press fit, as shown in Fig. 4, has been established by the standard sheets D.I.N. 54 and 55, which have been available since 1923.

Prior to a detailed consideration of the objections of Sawin, it must be remarked that all the questions which Sawin believes to be new were thoroughly discussed, examined in actual practice, and solved in a substantially correct manner in Germany in the years 1917 to 1918, as has been fully demonstrated by the extensive and uniformly successful experiences which have been made in this ten year period with the D.I.N. system as set forth in detail farther on in this article. A study of this German experience has taken the author quite a little time, for which reason a refutation of Sawin's article can only take place at this late date.

We will now consider one of the main objections of Sawin. "The graduation of the tolerances according to the law $0.005 \sqrt[3]{D}$ is wrong, and tolerances should be ascertained by reflection and experiment, and established individually for each diameter range."

The starting point in the D.I.N. system, in 1918, was to establish in the first place the smallest manufacturing tolerances possible, in the same manner as Skoda, by considering the four main sources of error:

1—The surface, or area of the work
2—Measuring
3—The temperature
4—Geometry, or shape of the work

Results similar to those laid down by Sawin in Figs. 4 and 5 of his article were reached. The investigations were made in various plants throughout Germany. Of course, differences were always found amounting to a few thousandths of a millimeter between the results of the various works. From the very first, therefore, it was considered out of the question to choose a single, definite system of one firm as the final basis of the system to be chosen. Rather, it was considered necessary to take a mean value which covered as comprehensively as possible the experiences of all the firms and testing institutes, and to give consideration to other viewpoints which might affect the establishment of the tolerances.

The same fundamental work which was performed in Germany should have been applied to the establishment

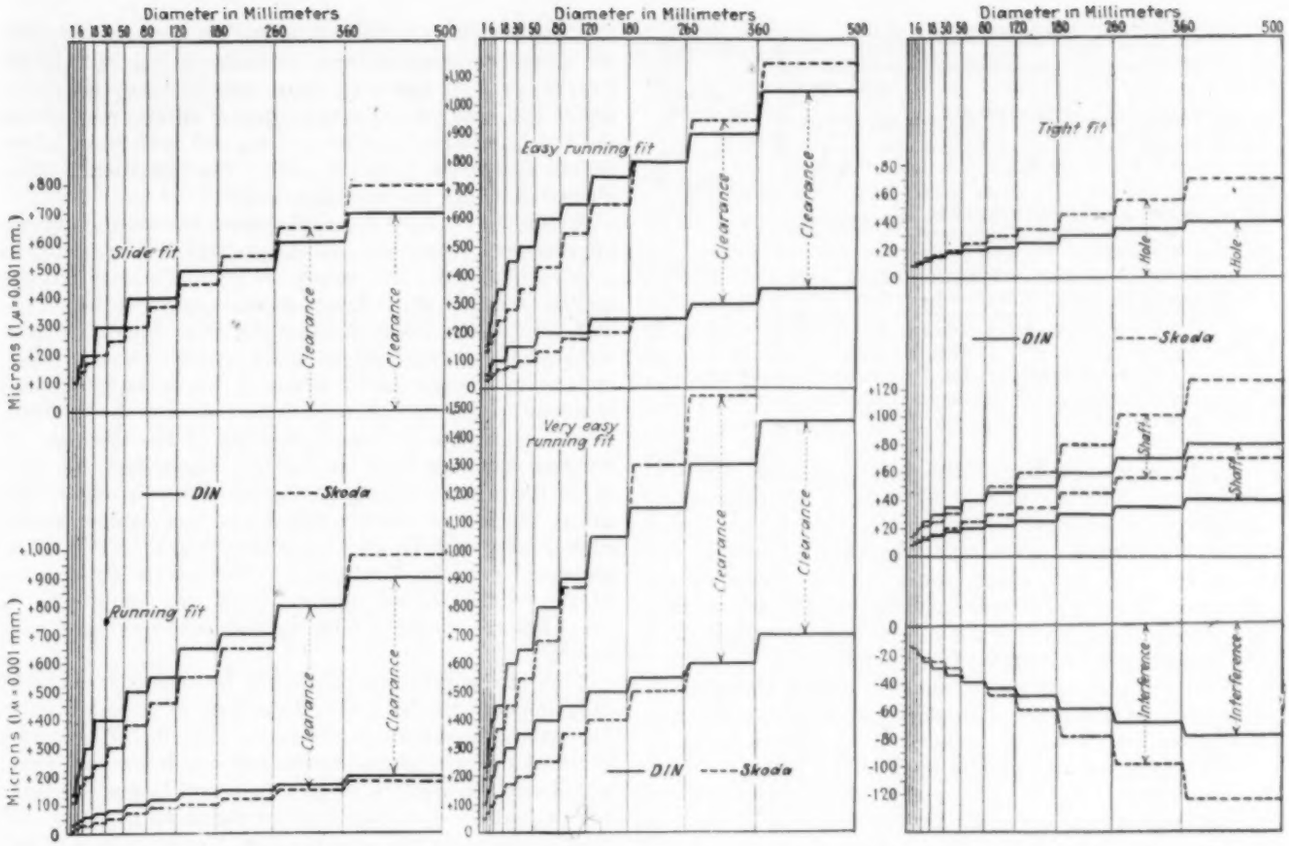


Fig. 6—Clearances of the D.I.N. system standard hole of the fourth quality compared with the clearances of the Skoda system. German experience has shown that the Skoda fifth quality with its two fits is unnecessary

Fig. 7—Skoda second quality tight fit compared with D.I.N. first quality hole mated with D.I.N. second quality shaft

of the Skoda system. The starting point should not have been the experience of a single plant or even a very few plants, but the experience of many factories of a high order and representing many types of work.

Only one example need be referred to to show how Sawin's values contradict the experiences of equally large and equally important firms. Thus, as shown by Fig. 1, the experiences of the Hanomag (Hannoversche Maschinenfabrik AG, Hanover-Linden) for instance, who employ 6,000 workers and who manufacture locomotives, steam engines, automobiles, and boilers shows other values for the curve designated "geometry" by Sawin than those according to Skoda. Sawin subsequently admits himself, in *Engineering*, March 30, 1928, page 375, that his values cannot lay claim to absolute accuracy.

In establishing the tolerances of the D.I.N. system a curve was looked for, that, on the one hand reproduced with sufficient accuracy the empirical values, and on the other hand met the requirement of not fixing in an uneconomically fine manner the tolerances within the range of the small diameters. The small diameters are the ones which are used the most frequently in mass manufacture, and any refinement within the range of the small diameters means a great increase in the manufacturing cost for the entire industry, especially because with small measurements on account of their small absolute size, a relative refinement in manufacturing comes to a much higher cost than with large parts. It was found that all the requirements of actual practice were met in an exceptionally satisfactory manner by the law $0.005 \sqrt[3]{D}$ and therefore, this law was used as the foundation of the entire D.I.N. system. Fig. 2 shows a comparison of the tolerances for holes and shafts according to D.I.N. and Sawin, taken at random from one quality fit from each class. The fifth quality fit of Sawin has also been added, although this does not exist in the D.I.N system.

The differences between the two systems, as already mentioned, lie chiefly in the fact that Sawin lays down tolerances which are smaller within the range of the small diameters, and larger within the range of large diameters than the D.I.N. system. The reduction of the tolerances for small diameters would only be justified if the D.I.N. fits produced with the larger tolerances were not satisfactory. The very fact, however, that the fits of the D.I.N. system are sufficiently exact for the small diameters is fully proven by many-sided practical experiences which will be dwelt upon later in this article.

The material increase in the cost of mass production which would take place due to the use of the Skoda system is shown by the following reflection: If, beginning with a diameter of 50 millimeters, for instance, we go down, according to Skoda, from 25 to 20 microns (one micron equals 0.001 millimeter), this 5 micron reduction signifies not only a 20 per cent increase in cost, but, under certain circumstances as high as 40 to 50 per cent. Within these fine limits each micron has a strongly noticeable effect. If, furthermore, in the drilling of close fitting parts we go down with 50 millimeters diameter from 18 to 14 microns, these 4 microns, according to the machine equipment available, not only mean a 25 per cent increase, but perhaps more than double as much. In fact, there are plants which cannot work at all within the fine limits wanted by Skoda, because the existing machines are not sufficiently accurate, and the workmen are not sufficiently capable and trained to produce them.

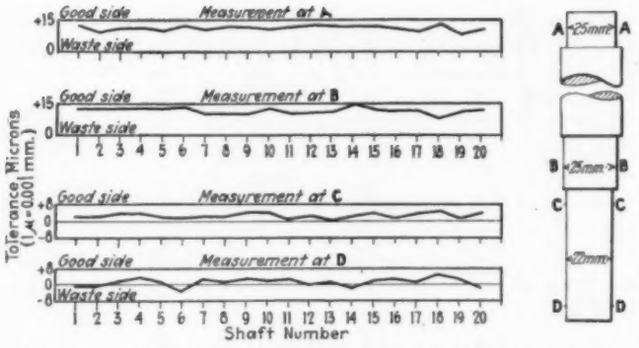


Fig. 8—Measurements of twenty ground motor shafts, taken at random in the Siemens-Schuckert Werke, show that only about one-half of the shaft tolerance is used

In the realm of large diameters conditions are different. In the first place, the smallest manufacturing tolerances ascertained by Sawin deviate in part very materially from the experiences of plants of equal size (compare Fig. 1). Then again, Sawin increases the tolerances to such an extent that the fits obtained thereby become doubtful, and presumably in part no longer meet the requirements of successful practice.

With the fine and extra-fine fits, Sawin changes the tolerances of the large diameters but little, so that the saving in wages which is implied by the increase in Sawin's tolerances as against the D.I.N. system becomes so immaterial that the increase at the expense of the poorer seat is not justified. If, for instance, in the fine fit for tight-fitting shafts, the tolerances which come to 60 microns in the D.I.N. system with the diameter of 360, are increased according to Skoda to 70 microns, that is about 16 per cent, (compare Fig. 3), this does not result in any or only a very little saving in the cost of manufacture. The reason for this is that it is necessary to subject large parts to a more careful manufacture on account of their high value. It may, therefore, be claimed that the systematically laid down tolerances of the D.I.N. system meet the requirements of actual practice better than do those of Sawin. Moreover, they have the extraordinary advantage of resulting in a simple systematic arrangement for the entire handling of this most difficult of all manufacturing foundations.

Sawin believes that he has found the main error in the D.I.N. system in the fact that the characteristics of the fits are not graduated according to $\sqrt[3]{D}$. By characteristics of the fits Sawin quite arbitrarily means the minimum play in the running fits; in the slide and drive fits the medium play; and in the tight fits the maximum play equals the smallest oversize.

What is important for actual practice is only the medium play, rightly considered, as the smallest or largest plays in actual practice occur but very seldom, that is, only when in both of the mating pieces all the errors come on one side or the other. It would, therefore, have been more correct and clearer to designate the medium play as characteristics of fits, and not in one case the smallest play, and in another case the medium play, and then again the maximum play as the smallest oversize.

If the entire structure of the D.I.N. system is compared with that of the Skoda system, the conclusion is reached that the D.I.N. system has a systematic structure, and that the Skoda system is without it. Largest and smallest plays are based in the D.I.N. system uniformly on the tolerance unit 0.005 $\sqrt[3]{D}$, aside from the press fit, while with Skoda only one limit of the play, the lower or medium one, is built up on $\sqrt[3]{D}$ (or $0.0008\,D$). In order to show clearly how the fits of the D.I.N. and Skoda system differ, all the joint fits of the D.I.N. system have been compared with those of the Skoda system in Figs. 3 to 6. The measuring arrow always indicates the tolerance field.

As shown by Figs. 3 and 4, Sawin has, at the expense of economy, kept the tolerances of the seats in the smallest diameters of the second quality and of the first quality smaller than those of the seats of the D.I.N. system. He has thus violated the most important principle of the fitting system which reads "good enough," and never "superfine." What is particularly striking, however, is the fact that the Skoda system shows thirty-three fits as against twenty-two fits of the German system, an increase of 50 per cent. Sawin has one more fit in the second quality (compare Fig. 4), eight additional fits in the third quality, and one supplementary fifth quality with two fits (compare Fig. 6). The largest increase lies in the third quality in which the entire series of fits of the second quality, from the running to the press fits are provided with substantially increased tolerances.

This is really incomprehensible because it is diametrically opposed to the aim and purpose of Sawin's action. He makes the downright assertion that the D.I.N. tolerances of the second quality are too rough for the boundary stationary fits, but he proposes still larger tolerances for part of the same fits even of the third quality. This clearly shows in my opinion that Sawin does not trust the ability of many plants to manufacture stationary fits in an interchangeable manner to the tolerances of the second quality. On the contrary, he thereby in my opinion admits that it is possible to make stationary fits with even greater tolerances than are shown by the D.I.N. system for that purpose.

Now, it is true that Skoda normally only uses eighteen fits, but this does not change the fact that thirty-three kinds of fits must be available after all for general purposes. By this Sawin violates the second principle, that the structure of a system of fits must be as simple and clear as possible so as to afford even the less experienced builder the possibility of intelligent use and insurance against mistakes.

Clearness becomes less possible with increase in the number of kinds of fits. The large number of fits may perhaps play no important part in so large a plant as the Skoda works, because trained experts are available for the selection of the kinds of fits and in fact for the tolerance work generally. In smaller and medium-sized

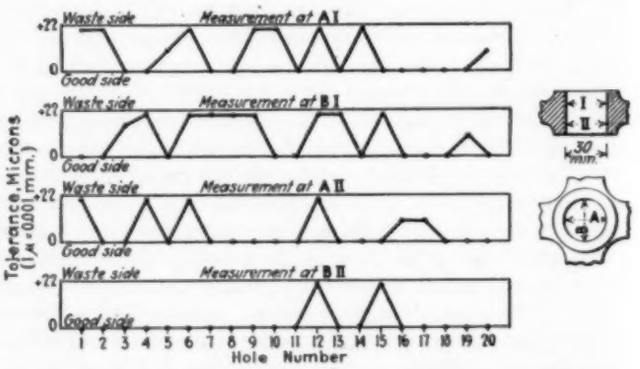


Fig. 9—Measurements taken in the Siemens-Schuckert Werke, of second-quality 30-mm. holes in red-brass bushings, show that the D.I.N. tolerance is about fully utilized

plants, however, and these prevail in number in any industry in all countries, this is not the case and it is desirable to restrict the number of fits so as to save the less experienced builder from making mistakes in the selection.

The fundamental question, however, on which everything depends, as to whether the fits of the D.I.N. system have proven satisfactory, cannot be solved by more or less theoretical discussion. The most experienced men in the plants themselves, and in construction matters, must take the floor and give the results of their experiences over many years. Only these experts are entitled and qualified to speak the decisive word in a field of endeavor where a fine finger tip feeling and many years' experience in construction offices and workshops are required. For that reason, it was decided in Germany to let a large number of leading firms express themselves through their superintendents and chief engineers, and to invoke examples from all fields in which fits are used currently and in large numbers. The following experts took part in this investigation:

(*a*) *For the machine tool industry:*

Director Moring of Ludw. Loewe & Co., A. G., Berlin.
Director Reindle of Schuchardt & Schutte, A. G., Berlin.
Chief engineer Mitan of Fritz Werner A. G., Berlin-Marienfelde.

(*b*) *For the large machinery industry:*

Director Basson of the Hanomag (Hannoversche Maschinenbau-Actien-Gesellschaft, Hanover, Linden).
Chief engineer Damm of the Hanomag Hanover-Linden.
Director Fichtner of Hentschel & Sohn G. m. b. H., Hassel.
Chief engineer Bartholdy of Fried. Krupp A. G., Essen.
Chief engineer Mauderer of M. A. N. (Maschinenfabrik Augusburg-Nuremberg).

(*c*) *For the automobile industry:*

Director Dr. Porsche of Daimler-Benz A. G., Unterturkheim.
Director Stuhlmacher of Wanderer-Werke, Chemnitz-Schonau.
Director Knoop of N. A. G. (Nationale Automobilgesellschaft, Berlin-Oberschoneweide).
Chief engineer Bethge of Maybach-Motorenbau, Friedrichshafen.

(*d*) *For the electrical industry:*

Chief engineer Muller of A. E. G. (Allgemeine Elektricitatsgesellschaft, Berlin).
Chief engineer Drescher of the Siemens-Schuckert-Werke (S.S.W.), Berlin.
Chief engineer Gartner of the Siemens-Schuckert-Werke (S.S.W.), Berlin.

(*e*) *For the transmission-building industry:*

Director Bader of the Berlin-Anhaltische Maschinenbau Aktiengesellschaft, BAMAG, Dessau.
Chief engineer Hogrefe of the Eisenwerk Wulfel, Hanover-Wulfel.

(*f*) *For the fitting experts:*

Dr. engineer W. Kuhn, Frankfort-on-the-Main.
Professor Dr. engineer G. Schlesinger, Technological Institute, Charlottenburg.

The expressions of these fitting and operating experts are given in a special issue of the magazine *Werkstattstechnik*, April 15, 1928, the entire issue of which is devoted to these questions. The expressions show throughout and without bias on the part of the respective authors that the D.I.N. system has given excellent results and that, if one knows how to use it properly, it can meet all requirements.

Of course, the theoretical possibility exists that the tight fit of the fine fitting in the border case, as follows from Fig. 4, may result in a sliding fit. This will only be the case, however, if the bore and shaft, both made with maximum errors, accidentally come together. This practically never occurs. Moreover, it is very rare according to experience, that an individual part, especially the shaft, lies towards the "waste side," since trained workers work towards the "good side" as a matter of habit. If it is desired under all circumstances, however, to have an absolutely positive tight fit, the tight fit shaft of the fine fit can be combined with the bore of the extra fine fit. Then as shown by Fig. 7, exactly the same thing is accomplished as that achieved by Sawin with the tight fit of the second quality. An absolutely positive fit, however, is also afforded by the tight fit of the first quality.

It is true, one must know how to properly use a fitting system and not slavishly adhere to the name of the fits in all cases which, first of all, are to be a guide for the constructor or builder.

Ball and Roller Bearing Practice

The best proof of the serviceability of the D.I.N. fits in the particularly difficult field of ball bearings and roller bearings has been furnished by the two largest German electrical plants, the Allgemeine Elektricitatsgesellschaft (A.E.G.) and the Siemens-Schuckert-Werke (S.S.W.), Berlin. The A.E.G. uses the tight fit of the D.I.N. second quality in the construction of small motors with an output of 20,000 tight fits per month. Moreover, in the same field of small motor construction, 40,000 stationary fits of the second quality are produced per month which have not led to any criticism either. The figures mentioned relate only to partial operations of the A.E.G. The total of the D.I.N. fits used in general by this giant concern, naturally comes to many times the figures here indicated.

In the S.S.W. over 160,000 D.I.N. fits are produced each month for ball and roller bearings alone. The floating seat of the ball bearing outer race in the housing belongs to the border seats whose manufacture in mass production causes the greatest difficulties found anywhere along these lines. The S.S.W. stresses the fact that the D.I.N. fits have given the best of results for a number of years even in this, the most difficult field as regards the construction of interchangeable parts on a large scale. If the system suffices in this case, the proof is incontrovertible that it meets the highest requirements.

For the purpose of determining whether the size of the tolerances of the D.I.N. second quality for motor shafts of the Siemens-Schuckert-Werke was correctly selected, a number of standard parts taken from mass production which had been labeled "good" by the inspectors was measured accurately. On 20 motor shafts picked out by way of samples the measurements shown in Fig. 8 were found. It is seen that hardly half the tolerances are utilized. A refinement of the tolerances is nevertheless inadvisable and entails higher manufacturing cost of the parts, as the measuring tools would then have to be replaced more frequently and the percentage of the waste which can never be avoided altogether, naturally turns out bigger in that case than with the present size of the tolerance field. The parts

examined were taken from the mass production of the electric motor works of the Siemens-Schuckert-Werke on the doubtlessly correct assumption that with the mass production prevailing there — 670,000 fits are created there according to the D.I.N. system, about 160,000 of which serve for the building of ball and roller bearings— it would be possible to arrive at unobjectionable findings.

It is true theoretically, to be sure, that the tight seat in the D.I.N. second quality affords the possibility of obtaining also slide seats, but the large scale manufacturing operations both of the A.E.G. and the S.S.W. prove, by a practical example, that with the D.I.N. system any desired seat can be obtained if the use of the system in the office and the shop is fully mastered. Any one not knowing how to use a fitting system properly will also have difficulties with finer tolerances, quite aside from the unbearable increase in cost which will take place due to a closer measuring of the tolerances and clearances than those which have given good results in the D.I.N system.

In conclusion, it is to be pointed out that others besides Germany have demonstrated the excellence of the D.I.N. system. Belgium, Holland, Italy, Norway and Austria use the D.I.N system throughout, or in part by omitting some of the fits. The difficulties claimed by Sawin has never occurred; and special attention is to be called to the fact that essentially rougher tolerance specifications are used in England.

A Simple System for the Small Shop

By T. Elison Kelly

ANYTHING that can be designated as a system seems to have its introduction resented in the small shop, as the shop executives are always afraid of adding clerical expense and the office space to maintain a system. The job card system here described is one that can be introduced in a small shop with a minimum of clerical work. It is based on the fact that the foreman is the man most instrumental in increasing production, and that a good foreman makes a study of his job, his men, and his equipment every working day of his life.

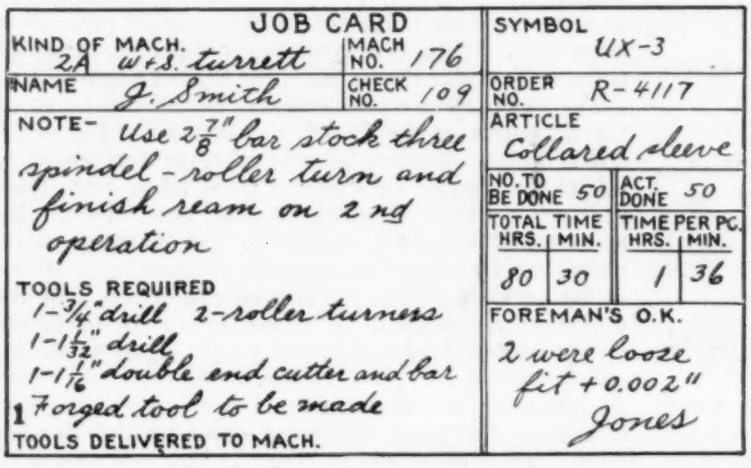
In the first place, it is necessary that a file of standard time on jobs be established in each foreman's office. Notes as to the peculiarities in the methods of doing the work, such as the use of special cutting compounds, recommended speeds and feeds, jigs, special tools, and special set-ups may be recorded on these cards as taken from previous observations or time studies. The many complex set-ups and tooling methods, such as are used on turret lathes, gang mills, and other machines, cannot be recalled by the foreman without written records.

A job card similar to that shown in Fig. 1 is used. The foreman fills in the order number, the symbol number of the piece, writes out the notes as to the method of manufacturing. He also designates the type of machine or particular man to do the work. The job card is then placed in a rack classifying the machine or the man to do the work.

The machinist goes to the rack before finishing the job he is working on, and under his classification picks out a job card for his next job. After signing his name and listing the tools required, he places the job card on the foreman's desk. The foreman adds to the tools required or checks same and submits the card to the tool room. Castings and materials are then moved to the machine. The tool room clerk gets out the tools, and has them delivered to the machinist.

The foreman records the time taken by his men on the back of their job cards, as shown in Fig. 2. A clerk can be secured to do this work if necessary, but it was found in our shop that by having the foreman do it, he is kept in closer contact with what is going on.

The advantages of the system are that it saves time lost between completion of one job and starting of the next job. In the small shop, there is generally a great loss of time in this way, due to the machinist looking up the foreman to ask for the next job and the foreman looking over orders to find work to be done, and then locating a helper to move material. In the same way, there is no loss of time under this job-card system in the rounding up of tools and waiting on the part of the machinist for their delivery. Moreover, the foreman is in a better position to see that the proper tools and jigs are used. With this system, the foreman can plan the jobs far enough ahead to permit his concentrating on better methods of manufacture. Finally, the cost department will have more accurate information.


JOB CARD
KIND OF MACH. 2A W+S. turrett
MACH NO. 176
NAME J. Smith
CHECK NO. 109
NOTE- Use 2 7/8" bar stock three spindel - roller turn and finish ream on 2nd operation
TOOLS REQUIRED
1-3/4" drill 2-roller turners
1-1 1/32" drill
1-1 1/16" double end cutter and bar
1 Forged tool to be made
TOOLS DELIVERED TO MACH.
SYMBOL UX-3
ORDER NO. R-4117
ARTICLE Collared sleeve
NO. TO BE DONE 50
ACT. DONE 50
TOTAL TIME HRS. MIN. 80 30
TIME PER PC. HRS. MIN. 1 36
FOREMAN'S O.K.
2 were loose fit + 0.002"
Jones

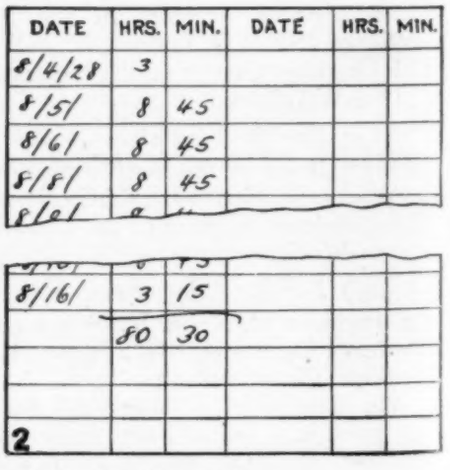


Fig. 1—Typical job card in a small shop. Fig. 2—Reverse of the card showing time entries

Inspection Methods and Their Application

By Fred H. Colvin
Editor, American Machinist

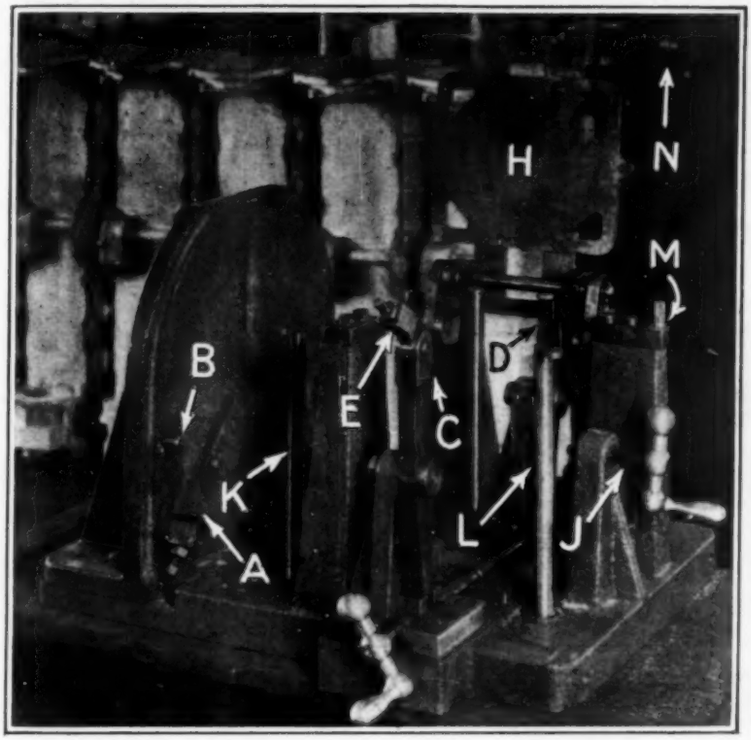
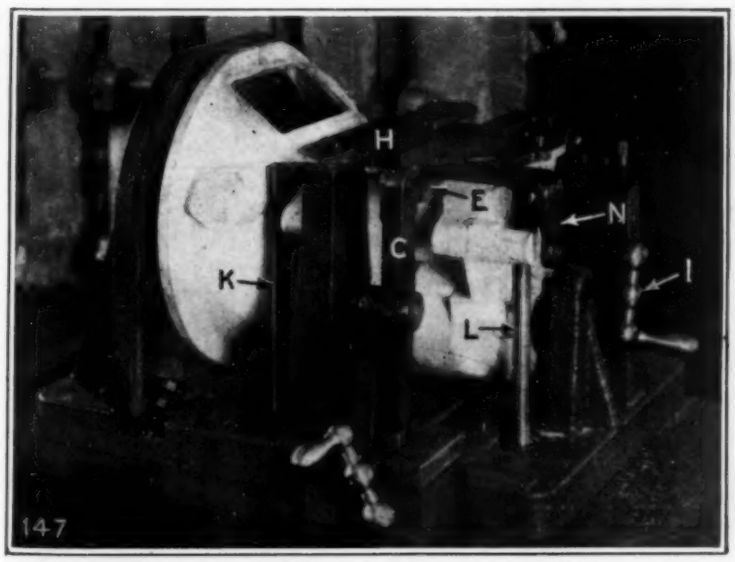


Fig. 146 — Fixture used for inspecting Franklin transmission-case castings before machining. The fixture locates the case with reference to the bell-housing flange, and centers the end by means of arms actuated by right- and left-hand screws

THE components that go to make up a complete transmission unit include cases, shafts, gears, forks and the like. Hence the inspection involves more gages and operations than might be imagined without a study of the details involved. To give a general idea of the different components and the way in which they are checked for accuracy, the methods of a few shops in inspecting these parts are illustrated and described. The fixture used in checking the Franklin transmission-case casting has a number of unusual features and is shown in Figs. 146 and 147, in which like letters refer to like parts. The flange of the bell-housing is supported in the jaws *A* on the angle plate. A pair of studs, one being shown at *B*, position the casting endwise. Arms *C* and *D*, which are moved by a right-and left-hand screw at the bottom, center the other end of the case by the flange to which the cover is attached. The swinging jaw *E* is provided for convenience in handling the case in and out of the fixtures and to clear the contour plate *H* when it is swung down in position. An end screw *J*, holds the case firmly in position against the angle plate at the opposite side.

The first part of the tenth article. The concluding part will appear in an early issue.



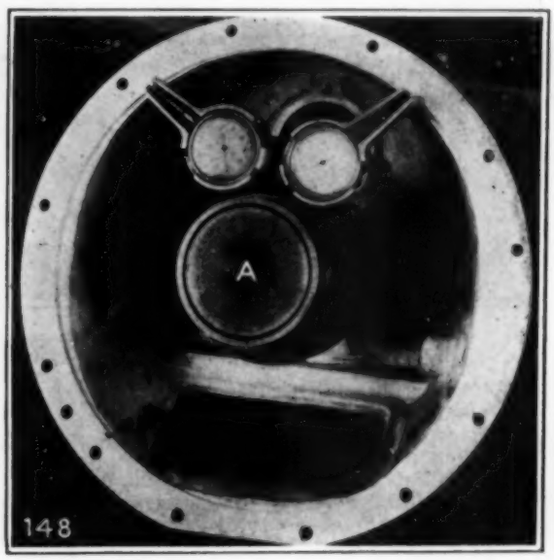


Fig. 147 — Transmission case in place in the inspection fixture, showing how it is held. The top plate is swung down and shows the distribution of metal around the top opening. The target gage at the end checks the location of the projecting boss. Fig. 148—Inspecting the end of the bell housing. The fixture checks both the counterbore and the face of the flange. The two dial gages are well protected against damage by being housed in cases that leave little chance for injury except from a direct blow on the glass dial covers

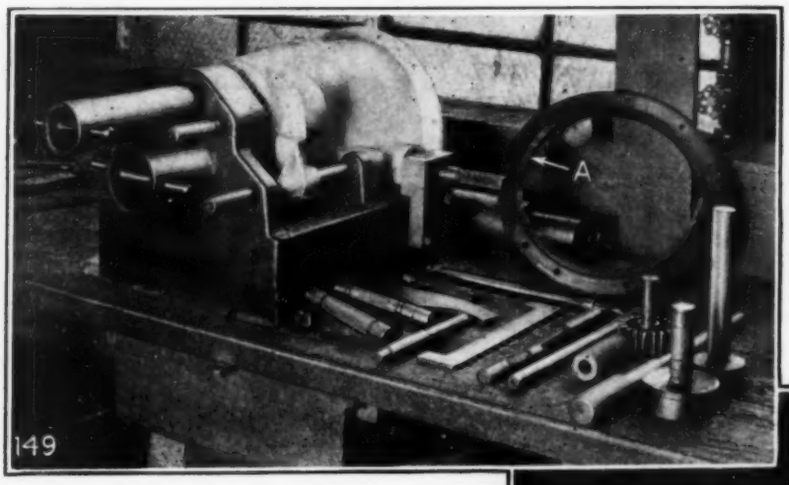
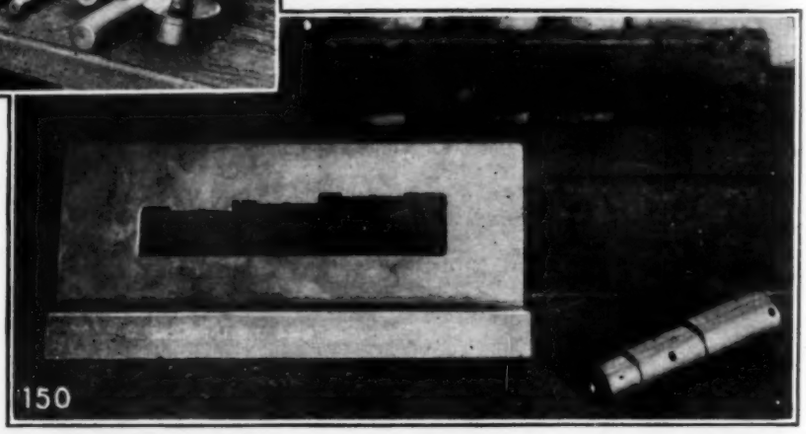


Fig. 149 — Checking up the location, size and center distances of bores in the completed crankcase. This fixture is very complete and has a substantial base that eliminates any likelihood of distortion when in use

Fig. 150—A combination limit gage for three diameters of an idler-gear shaft. The gage is built in two sections, the lower bar being straight and uniform. Any corrections made necessary by wear are easily made



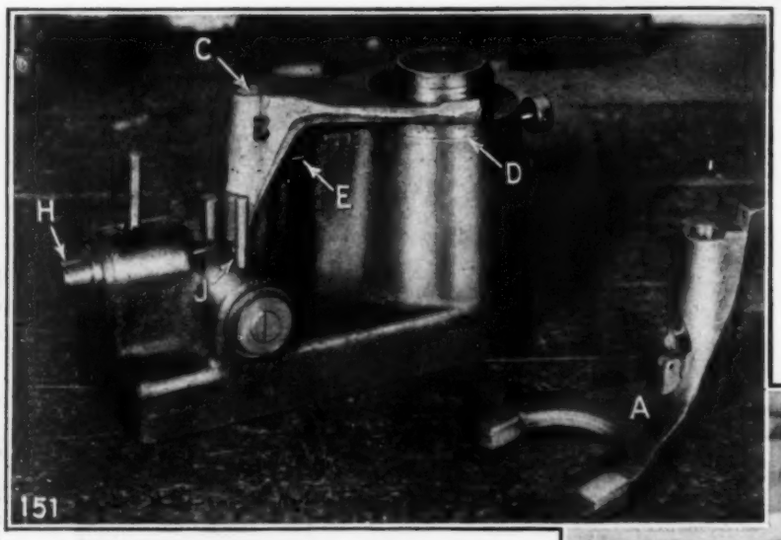
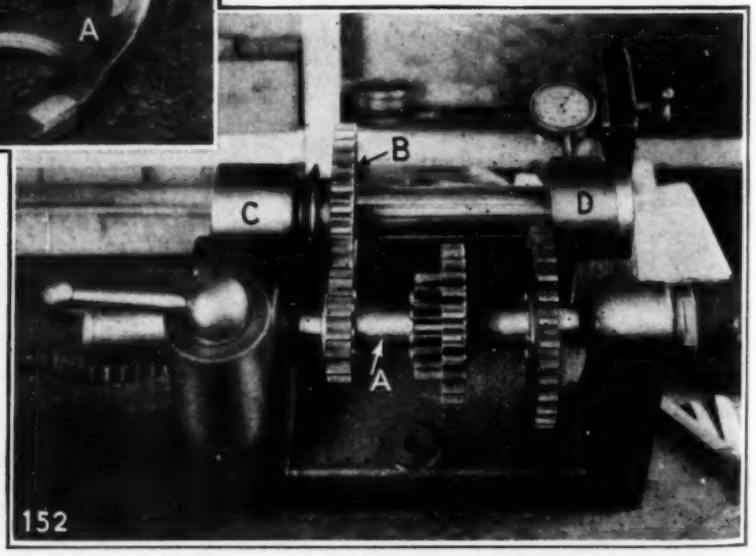


Fig. 151—Fixture for inspecting a shifter fork. This fixture checks the squareness and relative location of the fork fingers with the shaft hole, and tests the angle of the V-notch. Flush-pin types of gages are used

Fig. 152—Checking the concentricity of gears and shafts used in the Franklin transmission. The test gear slides on the splined shaft so as to mesh in each gear. The test gear is in a swinging arm and the dial gage shows any error



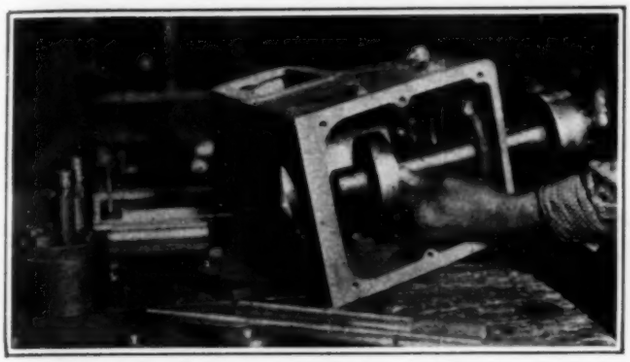


Fig. 153 — A general check-up of a Warner transmission case. The gages shown test the diameter, alignment and center distances of the different shaft bores

Uprights *K* and *L* carry swinging blades at the upper ends, which help to gage the upper surface of the case. The sliding block *M* checks the metal of the case at this point and the arm *N* forms a target by which the projecting boss can easily be inspected as to its correct location.

After the transmission case has been machined, the large, or bell-housing end, is checked for both diameter and squareness of face by the gage shown in Fig. 148. Here two dial indicators are mounted in substantial arms that thoroughly protect them, and at the same time hold them firmly as the fixture is turned on the central bar *A*. These two gages check both the squareness of the flange face and also the diameter and concentricity of the opening bore to receive the mating flange on the crankcase. It has been found that extreme care in securing both concentricity and squareness of the connection between the engine and the transmission case does much to eliminate gear noise and other troubles, and greater attention is being paid to the inspection of these parts.

A fixture for inspecting practically all the machined surfaces of the transmission case is shown in Fig. 149. The case is placed in the fixture and is located by its cover face on the planed surface of the base. The various test bars and plugs are then put in position, and check the accuracy, both as to the alignment and the spacing of the holes. The bolt holes in the flange are readily checked by means of the ring gage *A*. The other gages on the bench are used to check the various holes and surfaces in the finished case.

A combination go-and no-go snap gage for checking the three diameters of the idler-gear shaft used in the Franklin transmission is shown in Fig. 150. All the wearing surfaces are hardened and ground. The gage is made in two parts and can readily be corrected for wear due to use, by separating the two parts and lapping the gaging surfaces.

This form of gage allows the idler shafts to be inspected very rapidly, as the inspector becomes very expert in shifting them from one point to another without loss of time.

The shifter fork is one of the fussy pieces of a transmission and the fixture used by Franklin for checking it is shown in Fig. 151. The fork itself is shown at *A*, while at *B* it is in position on the testing fixture. Here it is slipped over a bar *C*, which represents the shifter rod, and in this position the bearing surfaces of the fork must be square on the collar *D*. The spread of the fork is checked by the projecting portion of the piece *D*. The alignment of the threaded hole is tested by means of the screw plug at *E*. The depth of the slot through which the gear-shift lever moves the fork, is checked by the flush-pin gage at *H*, this gage being easily moved back and forth by the handle shown. A similar gage at *J* checks the position of the lug. This gage is also of the flush-pin type and has a convenient handle for easy control. This fixture handles all of the inspection of the shifter fork.

In Fig. 152 is a fixture for testing the concentricity of the cluster-gear shaft that forms part of the Franklin transmission. The gear shaft to be tested is mounted between centers as at *A*. The testing gear *B*, mounted on a shaft held in a pair of swinging arms, *C* and *D*, is then swung into contact with the small gear on the shaft. Revolving the gear shaft shows on the dial indicator whether the swinging arms are moved back and forth or not.

The gear *B* is then moved to the next gear and the same test is repeated. By using a smaller test gear, the two larger gears on the shaft are inspected, and it is an easy matter to determine just how nearly concentric each gear is with the shaft centers.

Some of the gages, test bars and disks used in checking the transmission cases at the plant of the Warner Gear Works, are shown in Fig. 153. While there are no unusual features in this transmission case, great care is taken in inspecting the various dimensions.

An Unusual Management Article

Task work with bonus is popular in production shops and even in some toolrooms, but the chances are that not all of the basic principles underlying it have been given the study they deserve. One of the most thoroughgoing analyses that has ever been worked out will start next week, and finish a week later. There are only two pages in each installment but they carry more concentrated brain food than can be found in some books. The author is Walter N. Polakov, consulting engineer

· THE · FOREMAN'S · ROUND · TABLE ·

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

Does Appearance in Tools Count?

"WHAT do you think of that, Ed?" said foreman Al, as he detached a slip of paper and stuck the rest of the wad back into his bulging pocket. "It's a sheet of instructions to toolmakers and draftsmen that Williams sent me from the Evans Motor Works. Most of the things seem to be pretty good, but read that fourth item! Some statement to broadcast, isn't it?"

They were taking a midday bite at a neighboring "one armed lunch," and Ed studied over the sheet of paper as he sipped his coffee.

"Looks all right to me, Al. It says here: 'The appearance of the jig is of no importance whatever, and any time spent merely to improve the appearance is money wasted.' I think there's too darned much time spent by toolmakers trying to make jobs that you could use on the piano as ornaments, anyway. It's that way in our shop, too."

"Maybe so, but you wouldn't go on record as advocating a policy that appearance doesn't count, would you?"

"Don't know but what I would. Why not?"

"Every reason, Ed. Of course, the toolmaker or his boss has to use common sense, and not spend too much time on appearance. But let me tell you, old scout, that when you put a scabby looking jig out in the shop it gets scabby treatment. The operators think it isn't worth much, and treat it rough. But give them a nice neat job and they will be more likely to take care of it.

"Isn't it the same with everything, Ed? You like a nice coat of paint and plate on your car, and you know very well that when you go out nights where you want to be treated like a gentleman you doll up in a good-looking suit of clothes."

"But what's that got to do with making jigs pretty?"

"Just that. When a jig goes out into the shop it has to win the respect of the men, and the first thing they see is its appearance. If it looks as if it were built by an apprentice boy or a half-baked machinist you'll never be able to get them to believe that it is accurate or needs care."

"I don't agree with you at all, Al. I'd save the money wasted by toolmakers on frills, and make them give me something that would work—that's all I'd want."

"We sure differ on that point, Ed. If I were a toolmaker I wouldn't want to work in a shop where appearance doesn't count. It would go against my grain, and I wouldn't have pride in my work."

Is Al correct that the Evans plant is unwise in broadcasting instructions against appearance? Or, is Ed right in his idea that utility is the only thing that counts?

All foremen are urged to discuss these questions vital to their work; of course the

discussion is not limited to foremen. Letters accepted and published will be paid for

Discussion of Earlier Topics

Putting One Over on the Builder

A FRANK statement of the facts relative to the accident described here, if sent along to the machine-tool makers, would immediately suggest to them the necessity for some action that would prevent its happening again. The solution may be a simple shearing pin fixed at some point in the driving mechanism. It is safe to say that a free discussion on just how accidents happen will in most cases give birth to some method that will prevent their happening again. To hide these facts is a wedge in the wheels of progress.

—C. L. HENRY, *England.*

A Chance to Grow

THE statement that "only in the United States is there an equal chance," is to my mind a meaningless platitude. A recent visit to the West Indies has convinced me of the futility of "equal opportunity." The opportunities for the natives there are certainly equal—an equal chance to live under the most primitive conditions, with practically none rising above the prevailing "dead level." Equality is only a relative term, it's not what you attain by comparison with another, but what you actually get in itself, that spells success.

It is the very inequality of opportunity that makes the United States such a wonderful place in which to live and work. Every successful man who establishes a fortune, inevitably pulls scores of other men up into big successes with him. The man who stays wherever the fate of birth places him, and never looks about, will feel that opportunities have been overrated. He'll say "if there's an equal chance for all, where's mine?" That's just it; chances are not equal; but for the eager, the far seeing and hard working, the greatest opportunities in the world exist here. —JOHN W. GARDINER.

Reading the Shop Language

EVERY good mechanic must have a knowledge of drawing, for two reasons. First and most important, he must be able to read mechanical drawings. The lines on a blueprint must not be merely so many white lines on a blue background, but must delineate an actual object in his mind. In other words, he must be taught to visualize the object from the drawing. Second, he must be able to make such occasional sketches as the better mechanics are often called upon to make. He may be on a repair job which requires that a sketch be made of a broken part; or he may want to convey to another his ideas of a special tool, fixture, or machine part.

The course in blueprint reading should not be intended to make draftsmen, but to teach shop men the knowledge of drawing that they need as shop men. Ability to read drawings should be developed by examples from simple and well-known objects. The men should be taught to visualize the object in different views. —S. KUPPER.

IT SEEMS to be the nature of some men never to be able to grasp the meaning of lines and figures, no matter how much instruction they have. It certainly would pay to select the more intelligent operators for a course in blueprint reading, or better yet, to make it worth a man's while to get the necessary instruction outside the shop on his own time. Evening vocational classes in most cities place this instruction within the reach of all. Such instruction, whether given in the shop or in evening classes, should be under the guidance of a draftsman who has served his time in a machine shop.

—FRANCIS M. WESTON.

Equipment and the Foreman's Reputation

A POOR showing usually means that a cause must be found. To place the fault on the machinery, where it apparently belongs, would not provide an interesting outlet for the pent-up disappointment of the old man. A machine can't talk back when it is bawled out. A man can and will. So it is a certainty that Jenks will be held responsible in no uncertain terms.

However, I agree with Ed that Bill Jenks did wrong to quit because he couldn't have new equipment. He should talk of the disadvantages of old machines, point out the benefits of modern, plead for a change, but get the best out of the old machines. To say nothing about the old machines, or to become too threatening about them, is the wrong idea. —N. RICHARD.

IF BILL JENKS, after exhausting every logical means to convince the management of the necessity of decent machine equipment, still finds he is butting his head against a stone wall, he has only one recourse to save his self-respect. That is not to quit with the usual fire-

THE · NEXT · TOPIC

Finding New Ideas on Shop Visits

ADVANCE QUESTION

Williams is being opposed in his plan to send foremen to visit other shops. So he has prepared a list of things to look for, and foremen will report on what they find. Ed doesn't want to answer a lot of questions. How does it strike you?

works, but to survey the machine field calmly and carefully for existing opportunities, and when the right one offers, to resign with a dignified explanation of the reason.

Hasty action should be avoided at any time. There are sometimes circumstances beyond the immediate control of the boss. Boards of directors, financial tie-ups, executors of estates, pending mergers, and many other factors may have the hands of the boss tied for the time being. The foreman who merely growls spasmodically, and then quits, does not usually display sufficient intelligence for the boss to risk trying to explain the situation which may be temporarily out of his hands.

The foreman who shows by the reasonableness of his attitude toward the obsolete equipment, that he can be reasoned with, may often profit greatly as a consequence. Many times the condition is only a temporary one, and by his very objections he establishes his reputation to handle the job when better times are in sight. In other instances, the boss himself may be thoroughly cognizant of the situation, and may be planning to move along himself. The intelligent foreman will often receive an offer to accompany him when the time comes. Protecting his reputation is essential for the foreman, but the manner of doing it is of even greater importance.

—Charles E. Kirkbride, Jr.

MACHINE tools are not like the deacon's "One hoss shay," they do not go to pieces all at once. The gradual wearing-out process gives ample time to consider buying new ones, and the superintendent is in a much better position to decide the matter than the foreman. If the work should go bad due to the fact that the machinery was in poor shape, a careful explanation would be sufficient to clear the foreman of any serious injury to his reputation. —F. E. Clarke.

WHEN a foreman becomes convinced that his employer is not using ordinary common sense in the replacement of worn-out equipment, and will not listen to reason, he owes it to himself to resign his job. After all, a man does not work so much for his immediate salary as he does for the satisfaction his work gives him, and the future it holds for him. There is little satisfaction, and certainly no future, with an employer whose shortsighted policies are sure to result in the failure of his business before many months have passed. —M. Glickman.

Handling the Shop Office

BEYOND signing reports of a special nature, examining production records and checking cost estimates, the foreman's clerical work should be nil. The writer has yet to meet a foreman who would make a good clerk. Clerical work performed by foremen must, in many cases, be gone over by someone who knows the routine.

The practice of giving foremen sufficient clerical help is a farsighted one, and has two distinct advantages. First, the foreman can devote his time exclusively to a foreman's duties. Second, the clerk is receiving an excellent training in shop practice. Some firms are doing just this thing, all junior clerks engaged are placed in shop-clerks' positions. The experience thus gained is invaluable when promotions to higher grades are made.

—E. F. Weimar.

Standards for Machine Finishes

A SET of standard finishes, and standard speeds, feeds and lubricants necessary to get those finishes, are a great help, particularly to new workmen. It must be understood, of course, that these standards cannot be rigidly adhered to, because of such factors as slight differences in the composition of the metal. However, leaving the finish to the judgment of the machinist or inspectors cannot be called satisfactory. Men's judgments vary, and what one man may consider satisfactory, another may consider unsatisfactory. Standard finished surfaces, which can be viewed when desired, will put away doubt which may exist in workmen's minds.

—W. E. Warner, *England*.

IT IS an admirable practice to have instructions issued for the finishes for stated service conditions. When doubt exists as to the interpretation for any particular job, decision should be vested in the chief draftsman. Needless to state, he should make it his job to know how to interpret and to instruct. When the instruction notes are carefully drafted and widely known, it is surprising how relatively few times it is necessary to get a special ruling upon the matter. In the drafting of such standards, the chief designer, the chief draftsman, and several from the production department should have a part. —W. R. Needham, *England*.

Hiring in the Open

IT IS pretty hard for employers to visualize the need for treating applicants properly. To them the man at the gate is an outsider, with whom they have no especial concern until his name is on their pay-roll.

If proper relations are to be upheld between men and management, they must be cemented through the employment department. As its head, the employment manager should make a friend of the worker at the start. All interviews should be conducted with consideration, and there should be an absence of the cold atmosphere of buying and selling. Applicants should be received with personal consideration. —Arthur Fruncillo.

IN A great many of our factories, the men who present themselves at the employment window are treated like intruders. This is a serious mistake upon the part of the management of such a plant, for they are only tending to create antagonism in the hearts of those who are selling their services in an honest way. A worker very often sizes up a concern by the manner in which he is treated upon his arrival for employment.

If a company wishes to engage the services of the best men available, it will soon learn that it pays to have a clean and business-like reception room, with seats for all, if possible; also a modern employment system, with an application blank for each prospect. When you treat a man as if he were human, it is a sure bet that he will tell his friends, and when your company requires efficient men to fill important jobs, you will not have to advertise in distant papers. —Fred Aug. Schmidt.

The New Germany

By Dr. Julius Klein
Director, U. S. Bureau of Foreign and Domestic Commerce

Germany had a tremendous burden to carry after the War, but by a determined drive has regained lost markets, resulting in greatly increased exports in 1927

OF ALL the world-wide readjustments during this dramatic decade since the Armistice, the experiences of Germany have, beyond question, been the most amazing and spectacular. Indeed that sorely tried nation has been something of an economic laboratory in which profoundly significant experiments have been worked out, in some cases at tragic cost and in others with ultimate substantial benefit to the rest of the world. Her wartime isolation and post-Armistice necessities resulted in a series of astonishing advances in the application of new synthetics to industry which laid the groundwork for that corner stone of her entire industrial structure, namely the chemical group. She has led the way in the formulation of that much discussed device, the international cartel. Similarly, post-war necessities have provided fertile ground for the exploitation in her factories of the so-called "rationalization" idea with special reference to the applicability of numerous American practices. With her shipping almost entirely eliminated as a result of the War, she has had a clean slate upon which to develop a completely new type of modernized mercantile marine, notably through the use of motor engines. In the field of export trade her experimentations have included numerous variations of export insurance, co-operative selling, international-trade propaganda through expositions and other interesting new devices.

From practically complete industrial prostration ten years ago Germany has come back to a position of importance in international trade, an achievement almost without parallel in history. She holds today the center of European attention because of her pioneering in so many industrial and commercial matters

In a word, the new Germany has been a land not simply of complete change as compared with her pre-war internal economic status, but also of profound variations in her relations to business beyond her borders. She holds today the center of European attention because of the trials and novelty of her post-war experience, and because of her pioneering in so many industrial and commercial matters.

This is an appropriate month to review the situation; it marks the beginning of the fateful "fifth year" in the Dawes program, when, for the first time, Germany's obligations reach the maximum "standard" limit of about $625,000,000 a year. Quite apart from the political and diplomatic discussions which permeate this turgid issue there are certain fundamental economic tendencies in the German situation of deepest significance, not simply to that nation, but to all of her European neighbors and to us.

In pre-war days Germany was taking about 14 per cent of our total exports. Her share has been steadily increasing since 1922 and at present represents about 10 per cent with prospects of attaining the 1913 ratio within two or three years. Even more important as an indicator of the significance of German recovery to our trade position is the reaction of her situation upon the buying power of her neighbors. Any serious lapse of her buying power would promptly curtail our markets throughout Europe, which comprise nearly half our total foreign trade. Similarly, the relationships of her status to the prosperity of many nations in Latin America and the Far East scarcely require comment. It would be folly to assume, of course, that all of her problems are solved or in the last stages of solution. Great as her post-war accomplishments have been, she still has many issues to overcome. Outstanding among these is the problem of unemployment, which according to some authorities is likely to become a more or less permanent vexation because of profound political and social changes produced by the War. Nevertheless, remarkable progress was registered during 1927 in the reduction of the number of unemployed. Those who receive the Government subsidies declined from about 1,750,000 in December, 1926, to 567,000 on Aug. 15, 1928. But the tendency in recent months has been upward as contrasted with a corresponding period in 1927. There is still need for broader vision and more considerate policy on the part of employers in the matter of general labor relations.

The need of constructive action is evidently being at least appreciated. During 1927 occurred the first important increases in wages since the post-war depression —an advance averaging from 7 to 10 per cent, which more than compensated for the 5 per cent increase in living costs during that year. This has brought the real wages, namely buying power, of skilled workmen to about 3 per cent above the pre-war level and those of unskilled labor to 17 per cent above it.

The rapid rise in volume of savings deposits is another

interesting index of fundamental improvement in general conditions. Indeed it describes more eloquently than anything else the betterment which has taken place throughout the nation. In January, 1926, these deposits amounted to 1.8 billion gold marks; in July, 1928, they exceeded 5.9 billions.

At the outbreak of the War, Germany was the leading industrial country on the Continent, with her iron and steel and electrical activities second only to those of the United States and with a world dominating chemical industry. The War revolutionized the world market for chemicals, particularly dyestuffs. It also necessitated radical readjustments in the German iron and steel industry on account of the territorial changes effected in the treaties of peace.

Production of Basic Commodities High

In spite of these conditions Germany's production of many basic commodities is considerably above that of pre-war days, while her output of other products is rapidly approaching the 1913 level with a considerable increase in productive efficiency. Thus, we find that while the production of coal has increased from about 140,000,000 metric tons for the present territory of Germany in 1913 to about 156,000,000 last year, the production of lignite, which is rapidly growing in industrial importance, has advanced during the same period from 87,000,000 to 150,000,000 tons. Pig iron output has jumped in that time from 11,000,000 to 13,000,000 tons, crude steel from 11,700,000 to 16,300,000 tons and rolling mill products from 9,500,000 to 12,900,000 tons.

Measured in terms of the tremendous advancement in each of these respects in the United States this may not seem to be a brilliant showing, but everything considered it is a remarkable demonstration of the recuperative power of Germany. Of course, it is obvious that Germany should feel the world-wide depressions in numerous lines, notably textiles, shoes and other leather products, and coal which is encountering severe competition from substitute fuels.

Nevertheless, the much heralded and feared depression during the closing months of 1928, as an adjunct to the maximum reparations burden, thus far shows little indication of actual development. The fundamental situation, notably in the general commercial and financial position of the nation is sound and does not seem to warrant any serious pessimism.

Another evidence of the steady improvement of industrial activity throughout the country is found in the high activity of the machinery manufacturing plants, partly as a result of expanded sales to Russia, which now takes some 30 per cent of Germany's export of these lines—more than her five next ranking markets taken together.

The automobile industry is likewise growing. In this connection it is well to note that the country now uses one automobile for every 137 inhabitants as against one for every 196 in 1926—not an impressive ratio as compared with our 1 to 5 ratio, but nevertheless the 30 per cent improvement of Germany in one year would be difficult to match. There has been a marked advance in the German industry in the adaptation of American ideas of simplifying types and standardizing parts. In fact, an increasing proportion of the output is in cars for common use rather than in luxury and racing models. The tariff is being used to encourage the establishment of assembling plants in the country.

In the field of chemistry, German leadership is once more asserting itself. The German chemical trust which now dominates ninety-six per cent of the industry in the country is the highest capitalized industrial combination outside the United States. Its net profits have risen impressively from 54.7 million gold marks in 1924 to 103.2 last year. The last report of the corporation states that the expected results of its reorganization have been fully realized. Despite keen competition the trust's shipments of dyestuffs have considerably increased.

The industrial advance of the country has been notable in almost every particular. Germany's industries are being conducted on a far more efficient foundation than before the War, particularly in such basic lines as coal, chemicals, electrical goods, and iron and steel. One evidence of this is the fact that the horsepower of electric motors used in her mining and manufacturing activities rose from 1.4 million in 1907 to 11.4 million in 1925, within the present boundaries of the country.

American efficiency methods have made much greater headway in Germany than anywhere else in Europe. There are more visiting delegations of business men from that nation to our shores than from all of the rest of the Old World put together. The arrivals recently have reached a monthly average of fifty or sixty German experts in various industrial and engineering lines.

One of the most spectacular phases of her post-war renaissance has been in connection with transportation and communication. The War reduced her gross tonnage of merchant shipping from 5,000,000 to less than 400,000. With that insignificant start, steady progress was made toward an entirely new fleet which today exceeds 3,500,000 gross tons. It is important to note that in view of its predominantly up-to-date construction, its haulage efficiency is almost the equal of the pre-war fleet, because of the economies of the newer types of Diesel motors and recent developments in fuel saving devices, tending toward greater speed and lower cost of operation.

Railway mileage has risen since 1913 from 31,500 to 33,400 miles. But even more important has been the reconstruction of rolling stock and general equipment, which has increased the freight carried from 399 million metric tons just before the War to 489 million in 1927, with practically no increase in number of cars or personnel and a substantial decrease in locomotives.

German Leadership in Civil Aviation

The most spectacular feature of the transportation situation is the development of civil aviation in which Germany has led the world in many respects. For example, the number of passengers rose from 8,507 in 1923 to 151,000 last year and the distance flown was increased from 446,000 to 6,200,000 miles. Situated as she is, Germany has become a tangled mesh of air lines serving the whole of Europe in all directions. The requirements of the peace treaty have concentrated her efforts upon the development of aircraft for commercial uses and the result has been an amazing series of technical and administrative improvements in that field.

The major consideration from the point of view of the rest of the world with regard to Germany's recovery is, of course, her activities in the field of commerce. Her "unfavorable" trade balance which reached the formidable figure in 1927 of nearly $935,000,000 of excess of imports over exports, is quite naturally of profound concern, not only to Germany but to those nations interested in the adjustments of the reparations. The balance for the first seven months of this year, however, is somewhat more encouraging, since the excess of imports totaled a little under $500,000,000 as compared with ap-

proximately $580,000,000 for the same period in 1927. Of course, the upward climb of imports is primarily due to the need for raw materials required by the high activity in practically every line of industry.

The export developments have shown satisfactory improvement with an increase of 4½ per cent since 1926. On the basis of 1913 prices, exports for 1927 were about 75 per cent of the pre-war figure. Certain lines of exports showed slight declines in 1927, such as foodstuffs and other raw materials, partly because of the abnormal increase of coal shipments in 1926 during the British strike. In the major lines of fabricated wares, however, iron and steel, machinery, and chemicals, she is moving forward rapidly, as will be noted below.

German commercial recovery presages some competitive pressure which we are likely to observe in certain favorite markets of Latin America and the Near East. In some of the Caribbean countries, for example, Germany has already reached her pre-war level, and is on even terms with England, notably in Mexico and Cuba. In the larger Latin American markets she is still behind her pre-war share, but in Australia and in India her share has already improved, as is shown by the following table.

PER CENT OF TOTAL IMPORTS SUPPLIED BY GERMANY

Country	1913	1926	
Argentina	16.9	11.4	
Brazil	17.5	12.6	
Chile	24.6	12.1	
Mexico	13.1	7.4	
Australia	6.3	6.8	(1926-27)
India	6.9	7.3	(1926-27)
China	4.8	3.8	
Japan	9.4	6.	

With reference to her trade relations with the United States, it is significant that we continue to rank first as a source of Germany's imports, furnishing 15 per cent of the total, which is almost exactly the same as in 1913 and nearly as much as the next three countries (Argentina, United Kingdom, and the Netherlands) together. The bulk of our shipments are, of course, in raw materials—cotton, copper, wheat, mineral oils and fats. But there is a significant increase in manufactured lines, notably automobiles and machinery.

So far as Germany's export markets are concerned, we hear much about her rivalry to us in Latin America. As a matter of fact, by far the greater portion of her export interest lies in her immediate vicinity. Only 7 per cent of her exports go to Latin America, which is almost the same proportion as in pre-war days. It is, therefore, significant from the point of view of German recovery to note that the greatest gains in her export trade were in shipments to Europe, notably Russia. Much of the latter traffic was probably made up of American goods in transit through German agencies, as was the case in pre-war years, though the Russians would prefer to deal direct.

By far the most valuable single group of commodities in her exports were iron and steel products (exclusive of machinery), whose value exceeded 342 million dollars last year. This item was followed by chemicals with 282 millions, coal and coke with 211 millions, and machinery (except electrical) with 207 millions, electrical equipment being about 95 millions. This list approximates that of the last pre-war year, so far as relative importance of the various commodities is concerned. In terms of values, the figures indicate substantial increases in most cases, but price changes bring the net quantities down on the average to perhaps 75 per cent of the 1913 figures.

Germany's general commercial outlook still has many formidable obstacles. There is, of course, the major one of the trade barriers which she is encountering in all directions on the Continent and in the modification of which, as the result of the recent International Economic Conference, she has taken a major part. The retarded recovery of Russia is likewise a most important deterrent of her trade advance. Her exports to that market in 1913 approximated $210,000,000, whereas in 1926 they were less than $63,000,000 and if allowance be made for price changes, this would indicate an actual volume decline in that trade of not less than 78 per cent. Then too, there has been a marked advance in the industrialization of many once backward countries, which in pre-war years provided an attractive outlet for her specialties in cheaper grades of textiles, hardware, novelties, and dyes. The new industrial life that has awakened in the Far East and Latin America as the result of their war-time isolation and their new national consciousness has presented a problem of major importance to Germany's exporters.

These and other factors have forced the Government to adopt extreme measures of assistance, notably through export credit insurance schemes in which many thousands of policies were written last year. Headway is gradually being made in the solution of all of these problems. The Import and Export Trade Restriction Convention for the modification of trade barriers has now been signed by twenty-seven nations and Germany is one of the chief beneficiaries of this move. She has, in the course of the past twelve months, negotiated most-favored-nation treaties with seven or eight of her leading customers. The treaty with France which became effective in September, 1927, has been a notable contribution toward the clearing up of her commercial relations.

IMPORTANCE OF AMERICAN LOANS

Just how much of Germany's financial and industrial strength has been due directly to the steady flow of loans from America is, of course, difficult to determine. There can be no doubt, however, that this factor was of major importance in that connection. The total American capital now invested in Germany, including loans and branch factories, is probably about two billion dollars. After a lull early in 1927, the flotations are again increasing; the amount advanced in the second quarter of 1928 was $153,000,000, the largest of any such period in the entire history of our loans to Germany.

Although the United States has supplied nearly 70 per cent of the total long-term loans floated since 1924, its proportion has been steadily falling off year by year so that for 1927 it was approximately 64 per cent as against 74 per cent in 1925. Germany seems to be turning more and more for her foreign capital to her European neighbors; and then, too, the gradual rehabilitation of domestic finance is also affording an increasing source of funds.

In general then, and even with material allowance for many unsolved outstanding economic and social problems, there is no doubt as to the astonishing record of rehabilitation in Germany since 1924. She is laying a broad foundation upon which a substantial structure is already rising.

Systematic Tool Production *with Classified Costs*

By G. H. Bitzer

Assistant Supervisor of Production, Metal Stampings Department
Westinghouse Electric & Manufacturing Company

How a tool order originates in a large plant and the subsequent steps in building the tool with the cost accounting methods used

ONE of the largest tool departments in the country under one roof, employing between 280 and 300 toolmakers, diemakers and machinists, is operated by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. This department turns out approximately 300 new dies and fixtures, and handles an average of 250 repair jobs in a month.

Dies varying in size from those weighing 10 ounces, used in a small kick press, to large turbo-lamination dies weighing 2½ tons can be made in this department. Since all metal stamping, lamination and punch-press work is done in one department, it requires this large tool room to keep up production.

The die storage contains approximately 40,000 dies, jigs, and fixtures that are always ready for use, and requires a force of eight men who are constantly hauling dies in and out for use. This flow of work requires an efficient system of production. Each tool, die, jig and fixture in the works has a number, which is on permanent record for the life of the tool. A ledger contains all these numbers and shows the drawing, item, tool number and location.

When the sales, engineering and manufacturing departments decide that a tool is required, the project is taken up with the tool supervisor of the proper manufacturing department. The tool supervisor furnishes an estimate to the interested persons, who in turn arrange a budget to finance the construction. All tools shown on the ledger are built on stock orders, which have the following significance to the accounting department: Stock Order 2—Indicates that the customer agrees to pay for necessary tools; Order 3—This order indicates the work charge which is absorbed in the general overhead; Order 6—An experimental order, charged to the engineering department; Order 7—Charged to development, the cost of which is sustained by the sales and engineering departments; Order 92-2—Indicates alterations to tools to cheapen costs and increase efficiency; Order 92-1—Indicates additional or duplicate tools, and also repairs to existing tools; and Order 45—Charge denotes defective workmanship, and is used by one department against another. This charge tends to keep the quality at a high standard.

When the tool supervisor receives his authorization to build the tool he writes up the order on the form shown in Fig. 1. Six copies are made out and turned over to the production department, which in turn enters the dates of expected completion of the various stages of manufacture, and handles the job from then on.

Sheet No. 1 is held by the production department. Nos. 2 and 3 are turned over to the tool design foreman, with the latest copy of the engineering drawing, or sketch of the new tool. Sheet No. 1 is held in a "sketch due" file until the designer submits the sketch of the tool with No. 3 copy to the production clerk in charge. He compares No. 3 with No. 1, and, if no mistakes are apparent, enters the manufacturing order for the tool department in an active file. Sheet No. 4 is sent to the supervisor of the tool ledger for verifica-

New Tools Required — Form 5184-G W. E. & M. Co. Eng. Dept.

For Apparatus.....
Date..... Foreman.....
Dwg..... Sub. No..... Gen. Foreman.....
Item No..... Supv. of Tools.....
Tool No..... Supt.....
Annual Activity of Item..... Supt. Tool Dept.....
Charge..... Dept..... Est. No.....
Tool made in Dept..... Tool used in Dept.....
Assembling Sec..... Deliver to Tool Room.....
Tool Designed in Dept..... Tool Sk..... Sub.....
Reference Dwgs.....
Tool should also be listed on Dwgs.....
Date Wanted..... Promised..... Completed.....

DESCRIPTION OF TOOL—(Give all possible information to aid in designing tool).....

Give locating points.....
Are points rough or finished.....
Tool to be fitted to W. E. & M. Co. Mach. Tool No..... Size.....
Kind..... Maker.....

Fig. 1—Six copies of this order for tools are made out for the production department by the tool supervisor when he receives authority to build a tool

RECORD OF ORDERS — DWG. NO. _____ ITEM NO. _____ — Form 7554 W. E. & M. Co. CARD NO.

DATE	STOCK ORDER NO.	NO. PIECES	ITEM NO.		DATE	STOCK ORDER NO.	NO. PIECES	ITEM NO.	

Fig. 2—Every order and the number of pieces are shown on this form, which is also a check on tool performance and the status of orders

tion of the order, thus providing a double, independent check.

Sheet No. 5 is sent to the clerk in charge of the activity record who enters the tool number on the form shown in Fig. 2. This form, it will be noted, will show every order that was ever made under this drawing, item, and tool, together with the number of pieces completed. The activity record enables one to tell at a glance the performance of the tool, and also acts as a check against complete and incomplete orders. When the clerk has the tool number entered on the activity record, he sends sheet No. 5 to the cost department, which in turn fills out the form shown in Fig. 3, the form authorizing the cost department to allow labor and material for the construction of the tool. When the tool is complete the production department notifies the cost department so it can bill this cost against the budget pertaining thereto.

When the cost clerk figures the total cost of the tool, he fills out the form shown in Fig. 4, which is a permanent record for the life of the tool. The initial cost is shown on the first line. All repairs to tools are requisitioned on the form illustrated in Fig. 5 and, when completed, the figures are posted on the form shown in Fig. 4, which is the permanent record.

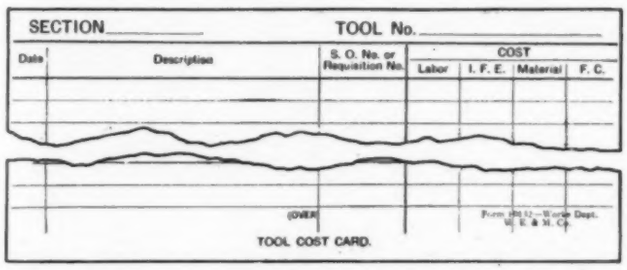


Fig. 4—The total cost of the tool is entered on this form, which is a permanent record for the life of the tool. All repair costs are posted on this sheet

Sheet No. 6 is sent to the cost-analysis department, which checks all budgets by estimates against actual costs. The forms illustrated in Figs. 2 and 4 are permanent records worth keeping as they show classified costs of the tool and the service obtained from it. The tool numbers must be placed on the proper engineering drawings, which is one of the duties of the supervisor of the tool ledger or record. The foregoing statements outline the cost and record system. In the following paragraphs the production system and follow-up plan are outlined. The entire production department is laid out in groups, each headed by a leader who is in direct charge of production in his group. Before the final verification of the design, the foreman and time-study man of the department, in which the tool will be used, must approve its general operation and sign the tracing as an indication of their approval. All tools that are being designed are recorded under a "date due" file and, when not completed by that date, a check is made and a reason must be given. When the tool sketches are complete, the designer turns over the prints to the man in charge of production, who in turn writes out the order on the

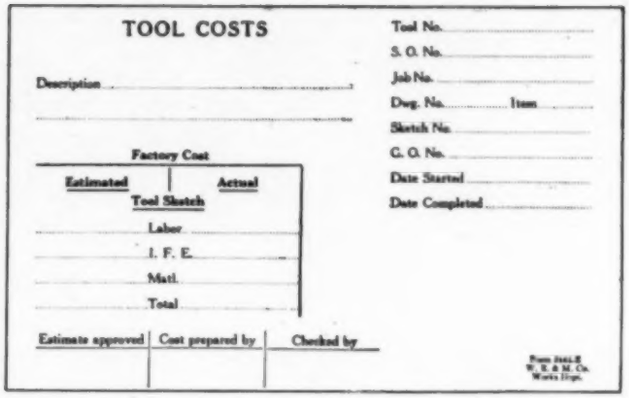


Fig. 3 — Authority to allow labor and material for the construction of a tool is conveyed by this form

form illustrated in Fig. 6, which is a hectograph form. There are 6 copies made of this form in five colors, namely, 2 white, 1 green, 1 pink, 1 yellow and 1 golden rod.

The distribution of the six copies is as follows: The first white copy is the office copy, and is kept under a tool number file, which also shows the group number on the floor. The second white copy is the storeroom record, and gives authority to issue material and hardware for construction.

The third copy is held in the office under a "date due" file, and this is the file that keeps the production load even and helps govern the future dates. It is well to keep this file open for about 10 to 12 per cent flexibility. For instance, all jobs that are due on July 10 will be filed under a caption of July 10, and, when new work is received, a glance at this file shows the dates on which the loads are low or high. It is a file maintained to keep a certain percentage of work coming due each day in order to facilitate the operation of the whole system.

Sheets 4 and 5 are the group leader's copies, which he files in the date file and tool number file, respectively. It may be noted that a date file and a tool number file are kept on the floor and also in the office so that a job may be located at any time. The sixth copy is used by the time clerk as his authority to issue time on the tool

Fig. 5—A requisition for repairs to a tool is made by the foreman on this sheet and must be approved by the general foreman or the superintendent

FEEDER DEPARTMENT REQUISITION — DATE WANTED

E.O.	PAGE	DRAWING	SUB.
STYLE		ITEM	PATTERN
QUANTITY		TOOLS	ROUTING & GROUP
DESCRIPTION & MATERIAL			
DELIVER TO	PROC. SPEC. OR FINISH No.		FINISHED WEIGHT
DATE SHIPPED		INSPECTOR'S SIGNATURE	
TOTAL TIME ALLOWANCE		COST DATA	
ADDITIONAL INFORMATION		PRICE PER—	
		VALUE—	
DATE WRITTEN			Form 13707-B W. E. & M. Co. Works Dept.

Printed in U.S.A.

Fig. 6—Authority from the production supervisor to build a tool is conveyed by this order. Copies go to the office, tool supervisor, storeroom, group leader, and time clerk

and, when the tool is complete, this copy is sent to the cost department to close the order.

A daily diary of all jobs due on that date is checked, and, if a job is not complete, a reason must be written on the back of the card and submitted to the supervisor of production for a re-order date or any overdue date. The number of overdues divided by the total orders in the department will give the overdue percentage, and it is obvious that the foreman will keep this low.

Display Board Shows Safety Record

A LARGE display board, hung at a prominent location of the Decatur shops of the Wabash Railway Company, where it may be seen readily by all, reminds the workers of the safety record already created. It also serves to warn them against accidents, as any man having an accident throws the whole shop back to zero. The length of time the shop has operated without an accident is indicated in days, the numeral being changed daily accordingly. At the time the photograph was taken the shop had gone 190 days without an accident. Bearing in mind that the normal force is nearly 800 men, the record is certainly one worth boosting, and as the number of "safe" days increases the incentive to keep up the good work increases.

A display board that indicates the safety record of the shop

A record of over three million miles without injury to a passenger, or the loss of an ounce of mail or express, since May 12, 1926, has been hung up by the National Air Transport planes.

Health Hazards in Chromium Plating

DURING the past few years chromium plating has developed rapidly, and it is now being extensively employed in finishing automobile parts and plumbing fixtures because of its high luster and resistance to tarnish; and upon printing plates, gages, tools, and dies on account of its extreme hardness. The bath used for chromium plating consists principally of chromic acid. During the plating process, considerable hydrogen and oxygen are liberated, and these carry a spray of chromic acid into the air. These facts prompted the U. S. Public Health Service to make a study of health hazards in chromium plating, in which it was assisted by the Bureau of Standards.

It has long been known that, in the manufacture of chromic acid and chromates, the operators are subject to attack by an ulcerative process and perforation of the nasal septum, and to the formation of ulcers or "chrome holes" upon the hands or other exposed parts of the body. Accordingly, some provisions have been made in all chromium plating plants for artificial ventilation and for other sanitary measures. In spite of these precautions, however, the employees in some plants have been affected in the above mentioned ways.

In order, therefore, to determine the extent of the hazard and the best means of overcoming it, a survey was conducted in several commercial plants. This included a study of the method and degree of ventilation, of the concentrations of chromic acid in the air breathed by the workers, and a physical examination of the workers themselves. Although only six plants were visited, and 23 persons examined, the results were so consistent in different plants, and agreed so well with previous experience with chromates, that certain tentative conclusions and recommendations are warranted. They are summarized below:

It was found that exposure to very low concentrations of chromic acid, that is, 1 mg. in 10 cu.m. of air, or one-sixtieth of a grain in 350 cu.ft. (which may be considered approximately the volume of air breathed by a worker in 8 hours), is sufficient to cause nose-bleed and nasal inflammation in a week or less. Higher concentrations or longer exposures cause extensive attack and even complete perforation of the nasal septum. This is painless, however, and the operator may be entirely unaware of the perforation. Many of the employees were found to have chromium ulcers on the hands or other exposed parts of the body. No evidence was found of injury to the respiratory tract except in the nose, nor of any effect upon the digestive system or the kidneys.

While, therefore, there is a real hazard in chromium plating, it is not critical, and can be entirely eliminated by suitable measures. These should include an effective system of ventilation in which the air is drawn horizontally across the plating tanks into a narrow duct in which the air velocity should be about 2,000 ft. per min. So far as possible, rubber gloves, aprons, and shoes should be worn. Frequent applications of vaseline or mentholatum salve to the nose and hands greatly reduce the danger of ulceration. All cuts and abrasions of the skin should receive regular inspection and medical treatment.

If these simple, entirely practicable measures are taken, the hazard can be practically eliminated. There is no reason, therefore, to fear any serious injuries from the extension of chromium plating that is likely to occur in the next few years.

Standard Classification of Iron and Steel Scrap

(Continued from Sheet No. 40)

CORRODED BORINGS AND TURNINGS. Corroded and lump borings, turnings, and similar stocks free from scale, other metals, dirt, or foreign material of any kind. No dimensions will exceed 9 in. Alloy steel scrap may be excluded by mutual agreement between buyer and seller. It is used in the blast furnace.

No. 1 HEAVY MELTING STEEL SCRAP. Steel scrap ¼ in. and over in thickness, not over 18 in. in width and not over 5 ft. long. Individual pieces must be cut into shapes free from attachments, and will lie flat in a charging box. Cut boiler plates must be practically clean and free from staybolts, and not over 3 ft. long. Smaller dimensions of plate scrap may be required by mutual agreement, but no piece is to weigh less than 5 lb. This material may include structural shapes, angle bars, plates, steel castings, heavy chains, carbon tool steel, heavy forgings, forged butts, and similar heavy material. It may also include mashed pipe ends, sheets, bars, billets, blooms, rail ends, railroad steel, and wrought scrap. No skeleton plate scrap, agricultural shapes, annealing pots, boiler tubes, grate bars, cast iron, malleable iron, or unwieldy pieces are to be included. It must be free from dirt, excessive rust or scale, or foreign material of any kind. Alloy steel scrap may be excluded by mutual agreement.

No. 2 MELTING STEEL. Plate scrap, such as car sides, automobile frame stock, tank crops, ⅛ in. and heavier. Steel parts or agricultural implements, automobile springs cut apart, rods and bars ½ in. and heavier. Punchings ¼ in. and over in thickness, heavy clippings, new unmashed pipe ends under 4 in. diam., horseshoes, and similar material. Car sides and all light plates are to be sheared 15x15 in., or under, and all tires and light rods are to be 12 in. or under in length. All twisted pieces must be sheared into such shapes that they will lie flat in the charging box. The material must be free from cast iron, malleable iron, scrap, dirt and foreign material of any kind. The maximum size is 15 in. wide by 3 ft. long, excepting car sides. Alloy steel scrap may be excluded by mutual agreement.

HEAVY SHOVELING STEEL SCRAP. Heavy, clean wrought-iron steel scrap ¼ in., and over, in thickness, not exceeding 8 in. in breadth or length, and no piece less than the equivalent of ½ in. square, 3 in. long. It may include railroad spikes, bolts, nuts, tie plates, boiler, bridge and structural punchings and clippings, small bar and shafting crop ends, and other similar material. It must not contain burnt material, cast or malleable scrap, cut pipe and tank, skeleton stock, badly corroded material nor any twisted or tangled scrap. It must be free from foreign metals of all kinds, from galvanized, painted, enameled or other coated stock, and from dirt and rubbish. Alloy steel scrap may be excluded by mutual agreement between buyer and seller. This material is for use in the basic open-hearth furnace.

No. 1 SELECTED SHEARING SCRAP. Angles from 2 in. up to 8 in. Structural shapes in single members from 4 in. up to 9 in., bars ½ in. up to 4 in. in diameter, and flats ½ in. to 2 in. thick and from 1 to 10 in. wide. It is to be in straight lengths and free from dirt and foreign material of any kind. Long length girder rails, free from cast welds and attachments, may be included by mutual agreement.

HYDRAULICALLY COMPRESSED SHEET SCRAP. New black steel sheet clippings, shearings, skeleton stamping scrap, side and end sheet, and tin-mill scrap. Hydraulically compressed into compact, rectangular packages not to exceed 20 in. longest dimension, weighing not less than 75 lb. per cu.ft. It must be clean and free from excessive rust, paint, or protective coating of any kind. No de-tinned scrap, electrical sheet, or material over 0.50 per cent silicon will be accepted.

SHORT SHOVELING FLASHINGS. Flashings or trimmings from iron or steel forgings, to be 10 in., or under, in length, suitable for hand shoveling, and to include no tangled or twisted material. Alloy steel stock may be excluded by mutual agreement. The material is used in the basic open-hearth furnace.

LONG FLASHINGS. Flashings or trimmings from iron or steel forgings which have been separated to a minimum length of 20 in., and not exceeding a maximum of 36 in. There must be a thickness in some sections of each of these flashings of not less than $\frac{3}{16}$ in. Alloy steel stock may be excluded by mutual agreement. The material is used in the basic open-hearth furnace.

MIXED FLASHINGS. Flashings or trimmings from iron and steel forgings not over 36 in. in length. Alloy steel scrap may be excluded by mutual agreement. The material is used in the basic open-hearth furnace.

No. 1 BUSHELING. Clean iron and soft-steel pipe and flues, tank, cut hoops and bands of No. 12 gage or heavier, steel plate punchings and clippings, soft steel and iron forgings, and flashings. No dimension should be over 8 in. It is to be free from burnt material, hard steel, cast, malleable, and galvanized or metal-coated material of any kind. It is for use in the basic open-hearth furnace.

(Continued on Sheet No. 40b)

Abstracted from Simplified Practice Recommendation R58-28

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· TECHNICAL · ABSTRACTS ·

Efficiency Experts and Common Sense

There are certain principles of efficiency which are universally applicable. The average plant manager is not trained in the theory of these principles while the competent industrial engineer is, and the latter should be able to suggest their application.

A misguided sense of proportion is the rock upon which many an efficiency expert has stumbled. There are undoubtedly many absurd notions and ideas advanced by efficiency experts. Conceding this, and having seen the havoc wrought by some of these self-termed experts, we still firmly believe that many if not most companies can spend their money to no better advantage than in securing the services of a competent man or firm of efficiency engineers. In adopting the trained understanding of the efficiency engineer, we take advantage of his knowledge of what other men have done to accomplish the result we desire.

In Taylor's system of scientific management, he proposed to work out by study and observation the best method of performing each item of work and to appoint instructors to teach each worker the desirable methods thus developed. Here is where the efficiency specialist fits in. He has devoted his time and energy to studying and observing the best ways to do things, while the shop superintendent or manager spent most of his time in doing them. The difference is largely one of breadth of outlook.

New materials, new processes, new designs, and new methods are daily replacing existing ones. Any executive who believes that he cannot learn anything to his advantage by considering the fundamental principles of efficiency as applied to his industry, is either unusually gifted or he is "missing a bet." On the other hand, anyone who becomes enthused with the principles of efficiency, and who tries to apply these principles without practical common sense, may find the results amazingly inefficient. — Homer S. Trecartin, Houghton's *Black and White*, October.

How to Weld Copper

All welders who have had occasion to weld copper and to test the completed weld are familiar with the fact that the joint often shows a disappointingly low strength. For a long time it was thought that the weakness was in the welded metal itself, but since test specimens were found to break at practically the same load per sq.in. of base metal, regardless of the composition of the welding rod used, examinations of specimens under the microscrope proved that the trouble was caused by the oxide present in ordinary commercial copper.

The electrolytic refining process yields copper of extreme purity, the total impurities amounting to only about 0.01 per cent. But this copper must be melted and cast into ingot form for use. The result is, that after the subsequent operations, the cast slabs or bars are sent to the rolling mills containing 0.01 to 0.08 oxygen in the form of cuprous oxide, and this minute amount is sufficient to affect the welding properties of the metal.

When cast copper cools, the cuprous oxide present separates out along the grain boundaries. As the oxide is brittle and has little strength, the metal structure is weakened along the grain boundaries and fracture tends to take place along these lines. During rolling, the original grains are broken up and the heating prior to rolling or the subsequent annealing results in the formation of new grains. As a result the oxide specks are scattered through the grains where they do not influence fracture. The heat of welding, however, is sufficient to cause the oxide specks to separate again along the grain boundaries of the base metal adjacent to the weld. This causes a zone of weakness. Numerous tests have shown that by using completely deoxidized metal and welding rod, high-strength welds can now be made in copper. Deoxidized copper is made by adding silicon to the molten copper just before casting. In reasonable quantities it may be obtained from most manufacturers of copper as promptly as commercial copper sheet and at no increased cost. In ordering, it is well to specify "copper completely deoxidized with silicon." It should contain from 0.05 to 0.15 silicon to allow for loss of this element during welding. —*Oxy-Acetylene Tips*, September.

Surface Hardening of Steel by Nitriding

Cementation of alloy steels in an atmosphere containing nascent nitrogen at temperatures considerably below the Ac_1 critical point has aroused sufficient interest and research in the technique of the art to make it economical to use in a commercial way.

Nitrides formed and dispersed at temperatures from 850 to 1,000 deg. F. advantageously locate and distribute themselves so as to resemble a metallic solid solution with iron. Steels favoring such reactions are not the iron-carbon alloys or plain carbon steels, but are the more complex alloys of iron containing aluminum, molybdenum, chromium and carbon. The molybdenum - aluminum carbon steels react most favorably, and are considered especially suited for this reaction. Electric furnaces, as well as gas and oil-fired furnaces are being used successfully, and when properly controlled they produce equally good work. A practical minimum of time at 950 to 1,000 deg. F., is from 15 to 20 hours for a definite case of approximately 0.020 inch.

Nitriding is done in a tightly sealed container connected with the ammonia tank. The box material is very low carbon steel which is not affected by the process. Perforated shells made of pure nickel sheets for distribution of the charge have been found entirely satisfactory. In order to obtain dry ammonia gas from the tank it is necessary to have the end of the delivery tube outside or above the liquid level in the tank. Any discoloration of the work is usually due to moist ammonia. Tubing material may be iron pipe or nickel tubing, preferably of nickel when an appreciable degree of temperature is encountered. An automatic recorder for a close temperature check over the entire period of processing is essential.

At present, steels for nitriding are of two general types, one type containing chromium and aluminum with the addition of modifying metallic elements such as nickel and molybdenum. The other type is a molybdenum-aluminum low-carbon steel. For extremely close dimensional requirements, a growth of 0.0005 in. should be considered for depths of 0.020 in. of case. Extreme hardness requires careful attention to generous radii of fillets and avoidance of sharp edges and corners. The surface finish of a nitrided steel part remains practically unaltered from that of the machine finished surface, except for a possible slight iridescent coloring. Grinding and polishing are performed prior to the nitriding process.

When charging the box, the finished steel parts must be practically free from grease, oily spots, washing compounds, and rust. They are placed in the perforated nickel shelves and distributed as uniformly as practical. No attempt is made to recover or save the gas. Holding the charge at 1,000 deg. F. gives a very convenient rate of penetration on the molybdenum-aluminum alloy that is approximately 0.001 in. of depth of case for every hour of operation. The chrome-aluminum alloy does not respond as uniformly nor as readily and the time periods are longer. Also the rate of penetration is not directly proportional to the time of exposure at 1,000 deg. F. At the end of the heating period the heat is turned off, and the furnace and box are allowed to cool slowly with the full stream of gas flowing until a temperature of 500 deg. F. is reached. Entrance and exit gas tubes are then removed and the container is sealed tight and permitted to cool in air until slightly above room temperature. Brinell hardness of from 900 to 1,000 is generally obtained by means of this process.—W. J. Merten, *Fuels and Furnaces*, October.

IDEAS · FROM · PRACTICAL · MEN

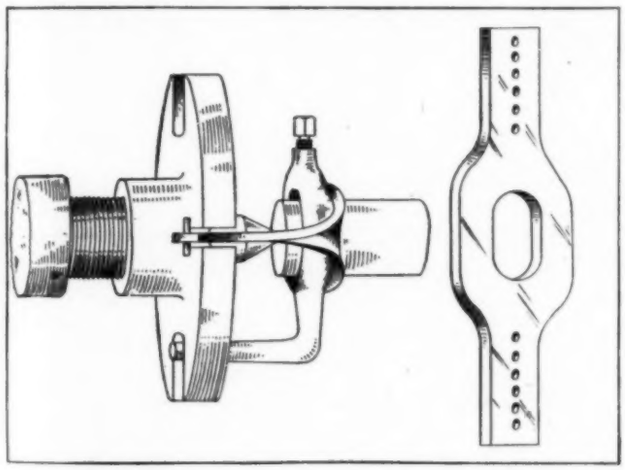
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

A Holdback Strap for Steadyrest Work

By H. L. Wheeler

The strap shown in the illustration is cut from a piece two-ply belting about 4-in. wide, and is designed for holding work against the headstock center while it is revolved in the steadyrest.

The strap has an elongated hole in the center through which the shank end of the work is passed before putting on the dog. A series of drilled holes in the strap



The holdback strap and how it is adjusted

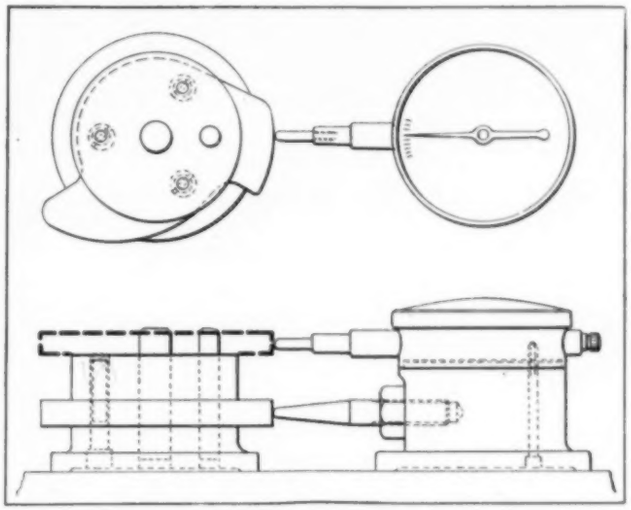
ends provides a means of pinning the strap back of the drive plate. The holes should be about $\frac{3}{16}$ to $\frac{1}{4}$ in. in diameter. Heavy nails or short pieces of cold-rolled steel may be used for pins.

To adjust the strap for tension, the drive plate is run out towards the end of the spindle. After placing the strap and the dog on the work in their proper positions, the ends of the strap are passed through the slots in the plate, giving them a quarter turn. Place the pins through the holes nearest to the drive plate, then screw the plate on to the spindle against the shoulder. This will pull the strap very tight against the dog, and hold the work firmly against the live center.

A Gage for Checking Contours

By W. R. Galloway

As shown in the illustration, a dial indicator is mounted on a special base having an adjustable contact located under the indicator spindle, in a vertical line. The part to be gaged is placed over a master form of the same contour and dimensions as the part. The master form and the part are separated by spacing plates so that



Checking contours by a dial indicator

their centers are of the same height as those of the adjustable contact-point and the indicator spindle respectively. The indicator is set to read zero when the contact point and the spindle are brought against a vertical surface, such as the edge of the blade of a square.

By revolving the master against the contact point, the part to be gaged will also be revolved against the indicator spindle. Thus, any error in the part, in comparison with the master, will be shown by the variation of the indicator pointer from zero. This type of gage was found to be cheaper to build than a gage of the receiver type, which is usually used for parts of irregular contour. The indicator and base can be used for numbers of different parts.

Hardened Drill Jigs

By L. Dark

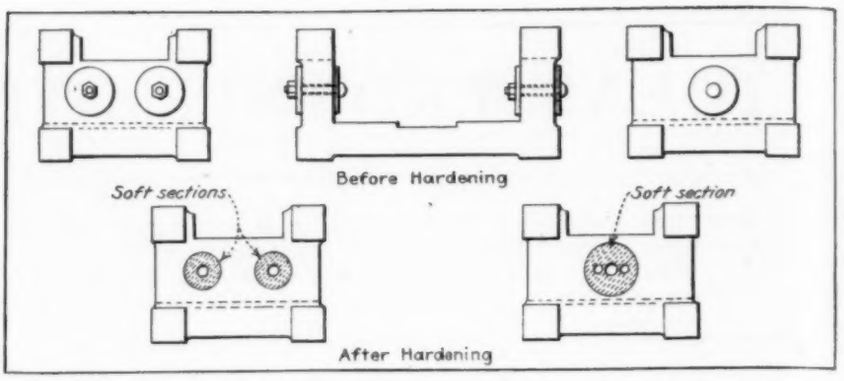
Hardened drill jigs may appear unduly expensive, but, when production demands are heavy, many plants find that they soon pay for themselves by continuing in use when jigs of the soft type, having hardened feet, etc., are under repair because of broken and loose parts.

By using the following method of manufacture, small hardened jigs such as the one illustrated will be found to cost very little more than the soft type, as the expensive operation of grinding bushing and location holes to correct distortion in hardening is entirely eliminated.

The jig body is first machined to shape from a suitable brand of casehardening steel, grinding allowances being left on all bearing feet and locating faces. All centers for bushing and locating pin holes are then marked off in a similar manner to that followed when laying out

tor boring by the button method. Holes of a smaller size than required for the bushings, are drilled, no special accuracy being required. Each hole is then stopped up by a washer on each face, held in position by a small bolt through the hole. The jig body with attached bolts and washers is then carbonized and hardened in the usual way, the depth of hardening being governed by the amount of wear the jig is required to stand.

After hardening, the bolts and washers are removed, leaving an uncarbonized section around each hole. After all locating faces and bearing feet have been ground, the holes for the bushings are rebored to size. The drawing of the sample jig body illustrates the method followed.



Hardened jig body, showing soft metal around bushing holes

Identification Marks on Triangles

By A. Gentner

Draftsmen will have less trouble in identifying their triangles if they put their signatures, initials or private marks on them in the following simple and effective manner:

Mix a solution of anhydrous acetic acid with a little black drawing ink. Use this mixture as a writing fluid and apply it with a heavy pen. The acid will etch the surface of the celluloid, and the ink will fill in the etched marks and show them up.

Keeping-Up Interest in the Bulletin Board

By A. O. Schaefer

Like most shops, we have a bulletin board. It's a well made bulletin board with a glass front, too. It functions very well. This I know because anyone in the shop can always tell me how our baseball or bowling team, the scores of which are posted on the bulletin board, stand in the big league. It is necessary to admit, though, that very few men are familiar with notices that are posted there dealing with certain important information that the management wishes to convey to them from time to time.

That is to be expected, as often the board is so full of notices that the new and important notice is buried. The old notices are generally left on the board for a while to let them soak in, or be digested.

I have found a remedy for this condition of disinterest in notices, and it seems to work very well. The idea was derived from the red-ball sign posted when there is ice-skating in the park. You know "The ball is up—get your skates out." I have made a red cardboard disk about 3 in. in diameter and on it I have printed "There is something new on the Bulletin Board. Please read it." This card I hang right in the center of the face of the time clock by a piece of string. On the *new notice* I pin a red disk about 1½ in. in diameter, having the word "IT" on it.

This idea works very well and might be of use to someone else.

Device for Drilling Driving Wheels for Hub Liners

By C. H. Easun
Stratford, Canada

A portable device for drilling the rivet holes for hub liners is shown in the illustrations. It was designed so that the drill could be driven by the motor portion of an air drill. The gearing is inclosed and runs in a bath of oil.

As will be seen in Fig. 1, the device is clamped to the driving axle, the operating part being mounted on short rods attached to the upper clamp. This method of mounting provides for raising or lowering the device so that holes can be drilled at different distances from the axle. When in the proper position, it can be fastened by setscrews. For drilling the various holes in the circle,

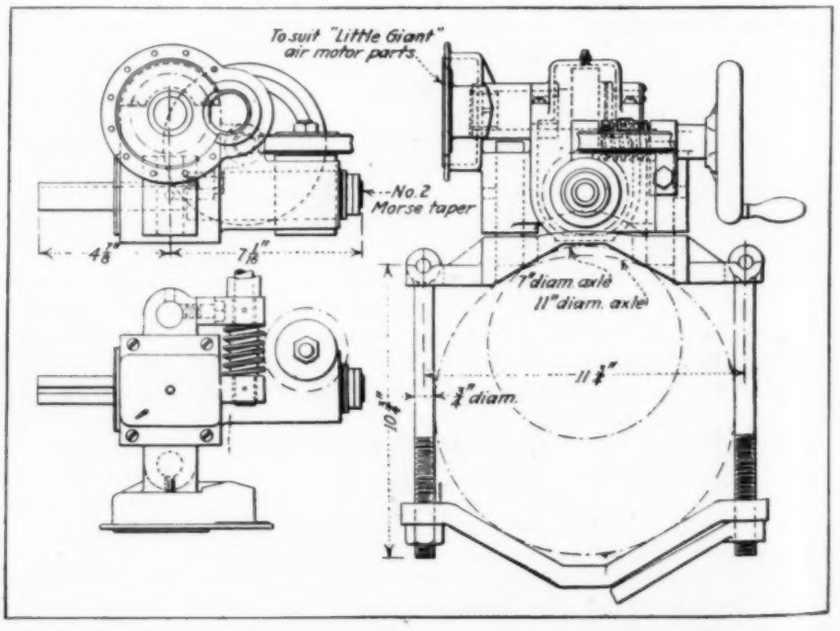


Fig. 1—Details of a device for drilling driving wheels for hub liners

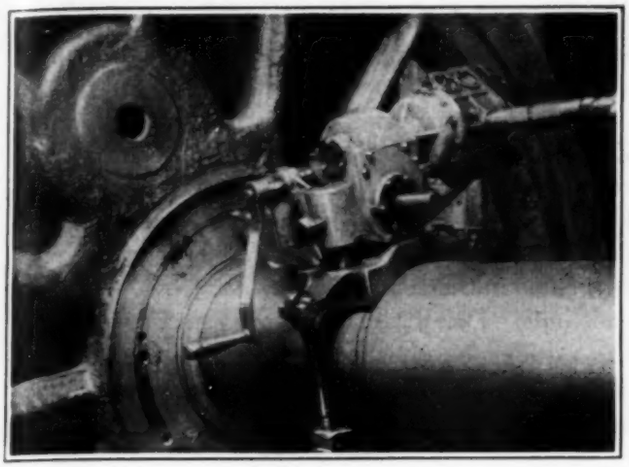


Fig. 2—Devices for drilling driving wheels for hub liners shown in use

it is necessary only to slacken the clamps and move the device the desired distance around the axle. Fitted with a suitable base, the device can also be used for drilling out tire-retaining rivets.

Repairing a Drill-Press Base by Welding

By George W. Meade

Iron castings are generally used for bases and supporting parts of machines. Gray iron, naturally somewhat brittle, has a tendency to crack and break when subjected to excessive vibration or shock. Replacement of such castings is an expensive item. It usually means shutting down the machine, removing the broken part and waiting until a new casting can be had to replace the broken one.

Present-day methods, however, have altered costly and troublesome delays. In Fig. 1 is shown a drill-press base, broken in three places. The method used to repair this part was torch welding with bronze. The construction of the casting is, on account of the openings and T-slots, not favorable for the application of a great deal of heat. Heat locally applied, would set up strains in the metal. By using bronze welding rods, this difficulty is overcome, because it is necessary only to bring the metal to a dull-red heat. At such a heat, bronze can

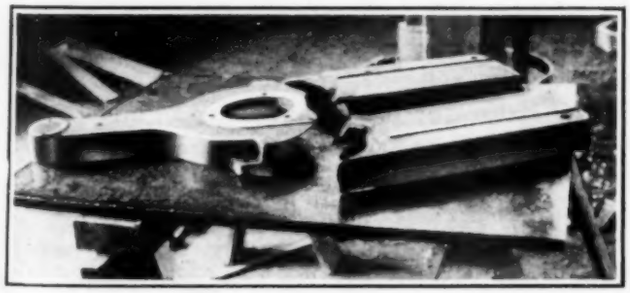


Fig. 1—The broken base

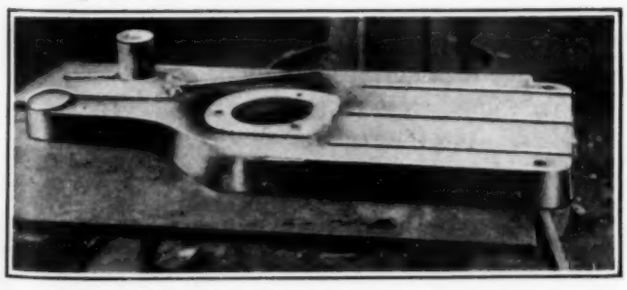


Fig. 2—Top of base after welding

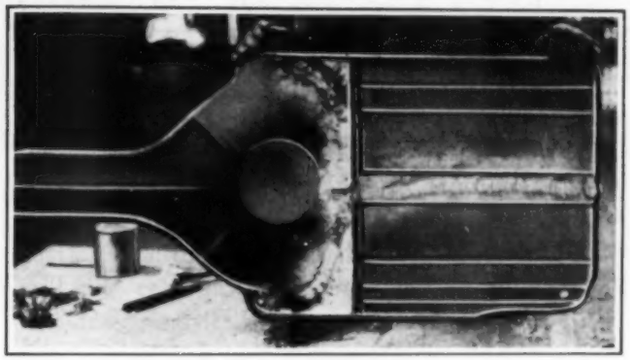


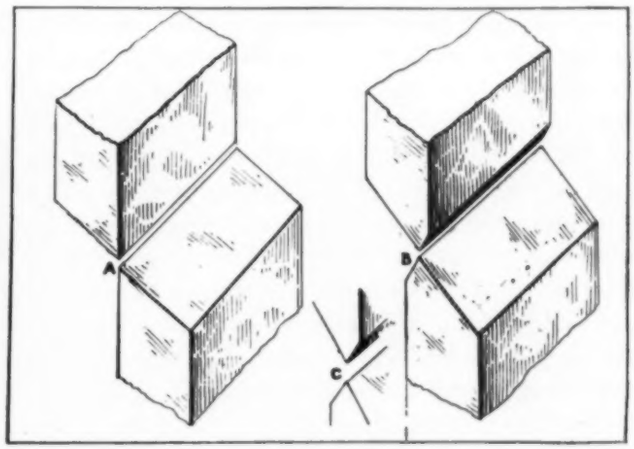
Fig. 3—Bottom of base after welding

be applied and will make a perfect joint. In Figs. 2 and 3 the top and bottom respectively of the completely welded base are shown. Repairs of this sort are very easy to make and the technique of welding with bronze is simple and easily learned. The repair was completed in an hour and a half, doing away with expensive and annoying delays of waiting for a replacement part.

Improving Sprue Shear Blades

By Frank C. Hudson

Shears for cutting sprues from brass castings are usually equipped by the maker with blades or knives as shown at *A*. One edge is straight and the cutting angle is about 45 deg. It is presumed that the idea is to make them easy to sharpen by merely grinding the top, or rake. Cutting edges of this form rarely prove very satisfactory, according to those who use them, and it seems to be customary to reshape them when they need sharpening.



Cutting edges on sprue shears

The blades at *A* have a tendency to crack pieces out of the cutting edge. The remedy seems to be to grind a bevel on the vertical edge as at *C*, making the blades appear as at *B* when reset in the machine.

The idea is to make the blades like cold chisels, the usual angle being ground on the face to give an included angle of about 60 deg. Regrinding in this manner lessens the breakage and adds to the life of the blades.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

The Graf Zeppelin Arrives

ONCE more a huge German dirigible has crossed the Atlantic, this time making the round trip. It arrived four years to a day after the coming of what we now know as the Los Angeles, and was navigated by the same pilot, Dr. Hugo Eckener. Although the westward flight was disappointing in many ways, the time being little less than that of the fastest steamships, adverse weather conditions and a damaged fin were largely responsible for the time required. The voyage, on the other hand, should give us confidence in the ability of the dirigible to meet such conditions, to make minor repairs in the air and particularly to carry sufficient fuel for long distances. For, in spite of her 113 hours in the air, the Graf Zeppelin still had fuel for many hours more. The return trip, made in 69 hours, and in the face of unfavorable weather adds much to the laurels of all concerned.

To the lay mind the problem of housing such a ship and of taking it out for a voyage is one of the great drawbacks to this type of aircraft. Even under the best conditions it now requires a ground crew of several hundred men to handle the ship and "walk" it in or out of the hangar. And even a very moderate breeze across the path of the ship makes it a hazardous undertaking. The cost of such handling added to the danger of damaging such an expensive structure constitutes a serious problem. The proposal to mount hangars on turntables so that the ship can always be pointed into the wind seems hardly feasible when the size of the building is considered. It is possible that hangars can be made round, or large enough to permit entrance or exit from several directions.

There is, however, little doubt that more dirigibles will be built, and they will be bigger and better as the years go by. These dirigibles will entail the erection of more hangars and mooring masts, which of themselves represent large expenditures for building materials and labor. The Goodyear-Zeppelin Corporation is to erect a hangar at Akron, Ohio, 1,200 feet long, 360 feet wide, and 200 feet high, supposed to be the largest in the world, at a cost of between two and three million dollars. This building will hold the two ships that are to be built for the Navy under a recent contract.

Whether or not the voyage of the Graf Zeppelin inaugurates regular transocean service remains to be seen. Enough such ships will be built, however, to play an important part in the development of the machine building industries, as well as in the fabrication of materials of different kinds. Dr. Eckener, his crew and passengers have added another page to our experience in air navigation and are to be commended on the successful conclusion of their transatlantic flight.

Excess Allowances

OF ALL the unsound practices associated with the selling of industrial equipment perhaps the most foolish is the buying of orders by giving excess allowances for used equipment. Such companies in every field are so strong, or so well managed, that their practice in this respect is above criticism, but it must be admitted that they form the minority. Of the others, a few have deliberately adopted the policy with the idea that they could capture more than their share of the business and thus achieve the volume of production that is supposed to be the royal road to profits. The rest have been forced to follow through fear of losing orders that they would have been better off without.

Excess allowances have been condemned on this page in every way possible and on every occasion when there was the slightest excuse. In trade association meetings, as well, rivers of words have flowed back and forth around this shoal which has withstood every attack. And the results have been equally negligible.

The excuse for these remarks is an advertisement just published by a large motor truck manufacturer in which the announcement is made that no more such allowances will be made.

Perhaps this is the entering wedge that we have been seeking in the fight to abolish an unsound practice. Certainly the advertisement will have the effect of stiffening the backbones of the agents for this particular company. A few customers will accept the policy as stated. Salesmen will use it to back up their own statements with tougher prospects. And the fear of what competitors will say if an instance of deviation from the policy leaks out will have a generally salutory effect on the weaker ones.

The experiment is an interesting one and well worth trying in other fields.

· SHOP · EQUIPMENT · NEWS ·

Producto-Matic Tap Squaring Machine

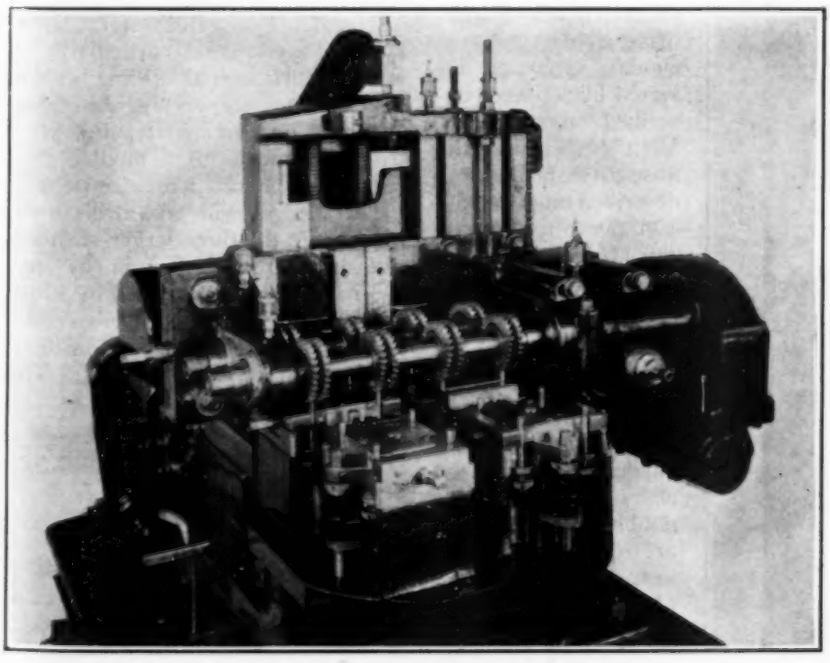
FOR the production squaring of all sizes of taps from ¼ to 1½ in., the machine illustrated is being placed on the market by the Producto Machine Company, Bridgeport, Conn. The machine is automatic in action, squaring four taps at a time. For sizes of taps up to ½ in., the production is up to 1,000 taps per hour. The production of 1½-in. taps is 300 per hour.

The machine has the standard Producto-Matic cabinet base and bed, and standard cutter feed drive. The cutter block is adjustable horizontally and is equipped with two spindles, which are adjustable independently of each other. The two spindles are in line on a horizontal plane, and the outer spindle revolves in a quill, which is adjustable by means of a micrometer screw in front. The spindles are driven from a splined shaft through a bronze wormgear and hardened steel worm.

The main drive is the same as for other standard Producto-Matic machines, consisting of operating cams on the main camshaft in the rear of the machine, and a standard gearbox at the left. The machine will feed the spindles either vertically or horizontally, or in both directions at one time. Both feeds are through cams, the vertical feed being transmitted through a Producto-Matic type of feed arm at the top of the machine, and the horizontal feed governed by an internal cam on the end of the camshaft. The indexing is carried by a lever action from cams on the rear camshaft. Both the camshaft and the spindle drive box are driven by silent chains from the change-gear cases in the bottom of the machine. The machine drive is by a 7½-hp. motor located in the cabinet base of the machine.

The work table is the same as for the standard Producto-Matic machine. Four fixtures are located on the table, each fixture taking four taps. The taps are first straddle milled on two sides, and the table is then indexed one-quarter turn to the second position, where the taps are squared on the other two sides.

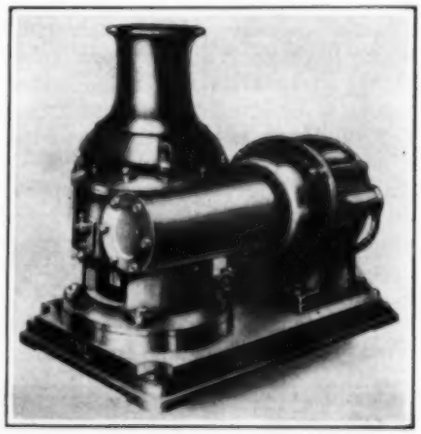
Automatic, forced-feed lubrication is used for the transmission, and the spindle bearings and slides have sight-feed oilers. An ample supply of cutting compound is pumped from a large capacity tank in the front of the base of the machine. Roller and ball bearings are used at all important points. The spindles are of hardened steel, operating in bronze bearings.



Front view of the Producto-Matic Tap Squaring Machine showing the center cutter arbor support removed so that the cutters may be seen

"IXL Hygrade" Car Spotter

An electric motor-driven car spotter known as the "IXL Hygrade" has been placed on the market by the Foote Bros. Gear and Machine Company, 215 North Curtis St., Chicago, Ill. The reduction unit used in the construction of this spotter is the same as the unit used in the IXL vertical wormgear reducer. The wormgear of this car spotter is made from chilled cast bronze which has exceptional strength and wearing qualities, according to the manufacturer. The worm is made from nickel steel, carburized, hardened, ground and polished. Ball and roller bearings are used to take care of radial and thrust loads on the worm and wormgear. The entire unit is mounted on a cast-iron bedplate.



"IXL Hygrade" Car Spotter

The motor is connected to the wormshaft of the car spotter through an inclosed spur-gear drive which provides part of the reduction. The final reduction for the running speed of the capstan is obtained through the worm and wormgear. All gearing is inclosed in a dustproof and oiltight case. Lubrication is effected by simple splash system through the action of the wormgear.

The capstan is made of cast iron, machined smooth, and is keyed to the upright vertical shaft of the reduction

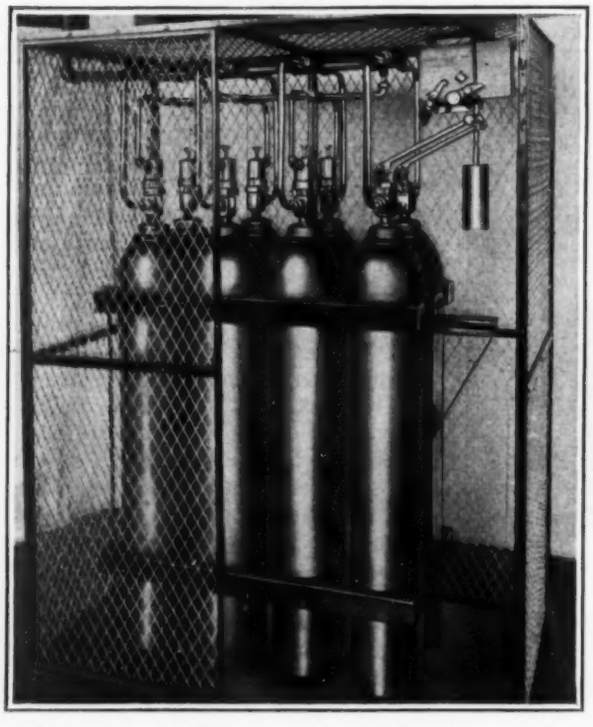
unit. The car spotter is furnished in two sizes, the smaller having a rope pull of 3,000 lb. and requiring a 5-hp. motor, and the larger having a rope pull of 6,000 lb., and requiring a 10-hp. motor. The units can be furnished with or without motor as desired. The base of the car puller unit is provided with pads for mounting the motor.

"Alfite System" for Extinguishing Fires

A system of carbon dioxide protection against fire, known as the "Alfite" system, has been developed by the American - LaFrance and Foamite Corporation, 250 West 57th St., New York, N. Y. The carbon dioxide is confined in a liquid state in metal cylinders 51 in. in height, and 8½ in. in diam., under a pressure of 900 to 1,000 lb. per sq.in. The system is designed to operate from one cylinder or as many more as may be needed. When it is placed in operation, a plunger ruptures a copper disk used to seal the gas in the cylinder, and permits the gas to pass through piping to nozzles located at the fire. Here the gas is liberated into the room or space being protected where it expands and dilutes the air enough to prevent combustion.

According to the manufacturer, air diluted with 17 per cent of Alfite is sufficient to extinguish flames, but, as a factor of safety, the system has been designed to provide 35 per cent dilution in the space being protected. Alfite is not toxic, nor does it damage fabrics, machinery, and the like. It can be kept in cold temperatures since the liquified gas does not freeze, and it does not deteriorate.

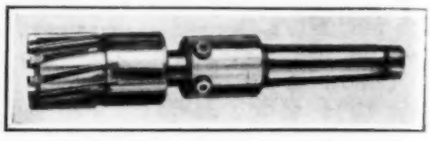
The system may be operated manually, semi-automatically, or automatically. A variety of operating devices are available. The installation is designed to give a 35-per cent dilution of the air in 1 min. so that the fire will be under control in 30 sec. Fire can be fought effectively with this system when it attacks lacquers and paint, whereas water would tend to spread it.



A battery of cylinders containing "Alfite" gas for extinguishing fires

Gairing Inserted-Blade, Nose-Drive Reamers

The blades of this reamer, which is of the nose-driven type, are supported on all sides over their entire length, except that portion which is extended clear of the head for chip clearance. The reamer has been placed on the market by the Gairing Tool Company, 1635 West Lafayette Boulevard, Detroit, Mich. Shank-drive tools using a similar type of inserted blades were described on page 398, Vol. 67, while the nose-drive holder was described on page 159, Vol. 69, of the *American Machinist*. The dovetail wedge slot in the reamer body is designed with an 8½-deg. angle in the cross-section and a 3-deg. angle in the longitudinal section. Blades are ground on all sides to fit this double-angle slot, and are driven in place. The dovetail forces the blade solidly against the bottom of the slot, and the wedge fits snugly along the entire length of the blade. When the reamer wears undersize, the blades are driven out and shims are placed under each blade. They are then driven back into place, the shims forcing the blades outward radially into the more confined portion of the slots, thereby increasing the diameter ready for grinding. Wear strips are provided on the rear portion of the reamer whenever it is necessary to guide the cutting blades over cored sections or where the diameter is large compared to the length of the blade. In the nose-drive type, as shown, a pilot is shrunk on the forward end of the reamer to guide the latter through the bored hole. Reamers from 2½ to 6 in. in diam. can be supplied.

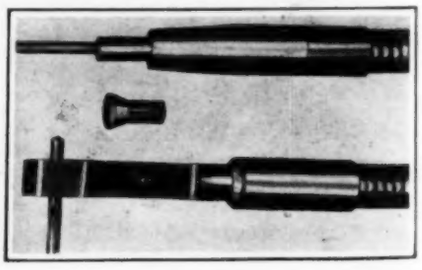


Gairing Inserted-Blade, Nose-Drive Reamer

"Midget" Close-Quarter, Right-Angle Drill

The "Midget" close-quarter, right-angle drill is the smallest of a line of drills designed for getting into confined spaces by Charles A. Koza, 464 Augustine Ave., Rochester, N. Y. The tool is intended particularly for aircraft work such as drilling between narrow members and against short shoulders on fuselage frames. It is driven by means of a flexible shaft held in the chuck of an electric drill.

The Midget will take drills up to ¼ in., while the three larger sizes will take drills from ¼ to 1 in. by steps of ¼ in. The drills are held in collets, each drill size requiring its own collet. The body of the Midget is made of bearing bronze, nickel plated. This



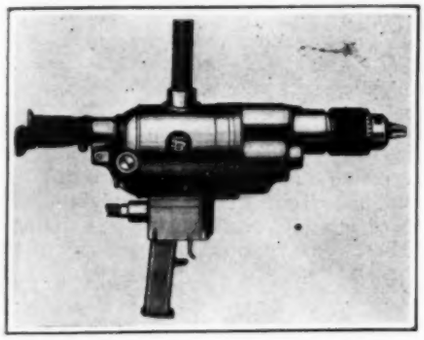
"Midget" Close-Quarter, Right-Angle Drill

feature permits proper bearing surfaces, and in addition saves space, the size of the tool being ¾ in. wide. Such a size permits drilling in a space ⅞ in. wide and in a corner ½x½ in. from the center of the drill.

Besides airplane work, the tool has been used in the manufacture of forging dies. For such work the drill is replaced by a small grinding wheel or burr. By means of adapters the larger drills can take wood bits.

U. S. ¾-Inch Heavy-Duty Drill

Designed particularly for heavy-duty service at low speed, a ¾-in. drill, having many characteristics common to the general line, has been



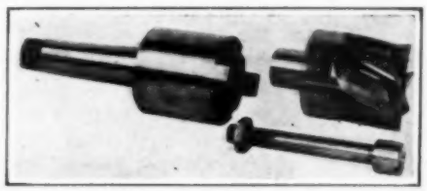
U. S. ¾-Inch Heavy-Duty Drill

introduced by the United States Electrical Tool Company, Cincinnati, Ohio. The drill is equipped with a universal motor for operation on a.c. lines at 60 cycles or on d.c. circuits. The spindle speed is 350 r.p.m. A three-jaw screw-back chuck taking straight shank drill bits is standard construction.

Features common to the line have been incorporated in this size. These include SKF ball bearings, chrome-nickel steel gears, hardened and running in grease, one-piece aluminum body frame and commutator head, and a quick make-and-break type, two-pole trigger switch. The ¾-in. drill weighs 27 pounds.

National Heavy-Duty Counterbore

Rigidity of the cutter in this heavy-duty counterbore is due to the taper shank construction. The tool has been developed by the National



Parts of the National Heavy-Duty Counterbore

Twist Drill & Tool Company, Detroit, Mich. As shown in the illustration, the driving lugs are placed at the maximum radius.

To remove the cutter from the holder, a taper pin is driven into the half-round grooves in the holder face. The hole between the lugs is ground to fit the taper shank of the cutter. A nut holds the cutter in place. The heavy spiral teeth of the cutter permit smooth, continuous cuts with minimum power consumption, according to the manufacturer. Counterbores from 1½ in. and up can be furnished.

Hisey-Wolf ½-Horsepower Portable Grinders

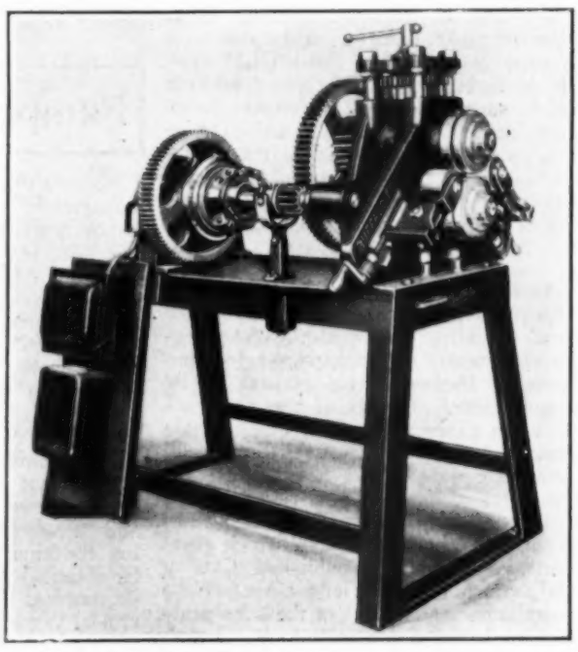
Portable grinders and buffers equipped with ½-hp. motors for single- and three-phase a.c. and d.c. circuits have been placed on the market by the Hisey-Wolf Machine Company, Cincinnati, Ohio. For single-phase service, an improved commutating type, respulsion, induction motor is standard, while for three-phase service a sturdy squirrel-cage motor is used. A compound-wound motor is used on the grinders driven by d.c. As will be noted from the illustration, the unit may be suspended from a spiral spring. All types use a 6x1¼-in. wheel having a ¾-in. hole. The a.c. machines operate at 3,425 r.p.m., while the d.c. types run at 3,550 r.p.m. Single-phase a.c. types operate on 110 and 220 volts, and the three-phase model, operates on 220 volts. The d.c. model operates on 115 and 230 volts. The net weight of any model is 38 lb., and the weight with

Hisey-Wolf ½-Horsepower Portable Grinder

the guard is 42 lb. The guard is adjustable and can be placed at any angle most convenient to the operator. The end cover is removable and affords a means for quick renewal of grinding wheels. The spindle has Timken tapered roller bearings.

Buffalo No. 0 Vertical Bending Rolls

By means of three hand-operated cranks shown, the rolls of the No. 0 bending machine can be adjusted in a few seconds. The machine has been placed on the market by the Buffalo Forge Company, Buffalo, N. Y. The frame is a one-piece steel casting and the legs and table are of welded steel. A quick-acting clutch is provided in the speed reducing mechanism. The machine is driven



Front view of the Buffalo No. 0 Vertical Bending Rolls

by a 2-hp. motor having a switch box with push-button control. Pulley drive can be obtained if desired. Bronze bushings are used throughout and the Zerk lubricating system is standard.

SPECIFICATIONS

Speed of rolls, r.p.m.	20
Speed of rolls, ft. per min	30
Motor rating, hp.	2
Motor speed, r.p.m.	1,200
Gear ratio	1 to 10.4
Length	3 ft. 10 in.
Width	2 ft. 6 in.
Height	2 ft. 6 in.
Weight, lb.	750

CAPACITIES

Angles, leg out, in.	1¼ x ⅛
Minimum diameter, in.	7
Smallest angle, leg out, in	½ x ½
Minimum diameter, in.	6
Flats on edge, in	1½ x ⅜
Minimum diameter, in.	7
Flats on edge, in	2 x ⅜ to 2½ x ½
Minimum diameter, in.	6
Rounds, in.	⅞
Squares, in.	1⅛
Minimum diameter, in.	6
Copper tubes, No. 12 gage, in	1
Copper tubes, No. 16 gage, in	1¼
Standard pipe, in.	¾
Minimum diameter, in.	6

Trade Catalogs

GENERAL ELECTRIC PUBLICATIONS. The General Electric Co., Schenectady, N. Y., has published three catalogs which are as follows: Bulletin 78A, superseding 78, describes crane and hoist motors "5900 Series," Form GL, three-phase and two-phase types; bulletin 482A, superseding 482, describes silent gears made from "Fabroil" and "Textolite," data on applications, machining and design being included; bulletin 1012, superseding 48721A, shows the use of electric heat in the General Electric factories.

OPEN-SIDE PLANERS. The Cleveland Planer Co., 3148 Superior Ave., Cleveland, Ohio, has published a leaflet showing by means of photographs the features of the open side planers of its manufacture. Details of the construction are given in a sheet of specifications conveniently arranged for ready reference.

OVENS FOR BAKED FINISHES. The Young Brothers Co., 6,500 Mack Ave., Detroit, Mich., has published Catalog 28J, which covers briefly a few of the most important factors of the oven practice of baked finish technique. Topics discussed are: the economy of the insulated steel panel ovens; types of ovens, and standard sizes. Many photographs of actual installations are presented so that the reader can visualize the practice.

SCREW JACKS. Templeton, Kenly & Co., Ltd., 1020 South Central Ave., Chicago, Ill., has published form 804 showing "Simplex" screw jacks. A table of specifications is given.

SINGLE-PHASE MOTORS. The Wagner Electric Corporation, St. Louis, Mo., has published Bulletin No. 157, showing a line of Wagner single-phase motors of the type R A single-phase, repulsion-induction type. All phases of the design and construction of these motors are shown by means of photographs and are thoroughly described. The catalog contains twelve 11x8½-in. pages.

TOTE BOXES, HANDLING. The Cleveland Electric Tramrail, Div. of the Cleveland Crane & Engineering Co., Wickliff, Ohio, has published form TR-623, entitled, "How Do You Handle Your Tote Boxes?" Photographs of various installations of tramrail overhead conveying systems are shown, together with the methods of conveying the materials in tote boxes and barrels.

USED MACHINERY. Botwinik Brothers, Inc., 57 Water St., New Haven, Conn. has published Catalog No. 120, showing a line of used machinery comprising presses, electric drills and grinders, arbor presses, lathes, precision tools, spot welders, bench tools, vises, portable woodworking machinery, belting, air compressors, key seaters, motors, and tool sharpeners. Specifications are given for each tool. Many photographs are included. The catalog, which is indexed, contains 186 9x6-in. pages.

Pamphlets Received

EMPLOYMENT SERVICE.—The U. S. Department of Labor, Bureau of Labor Statistics, has published Bulletin No. 478, entitled, "Proceedings of the Fifteenth Annual Meeting of the International Association of Public Employment Services," held at Detroit, Mich., Oct. 25, 1927. Among the subjects discussed were "Should employment work be a state monopoly," "Some of the problems of the middle-aged man," "Function of the Federal government in co-ordinated nationwide system of employment offices," "Uniform methods in management of employment services," and "Promoting good will." The catalog contains 36 9x6-in. pages and can be obtained from the Superintendent of documents, U. S. Government Printing Office, Washington, for 10 cents a copy.

INTERNATIONAL BOOK NEWS. — The World Peace Foundation, 40 Mt. Vernon St., Boston, Mass., has published for June, No. 4 of a series on international book news entitled, "The Industrial Number," which is a public list of international publications issued by the League of Nations and the International Labor Office that are of special interest to industrial and foreign trade executives. No. 5, known as the "Financial Number," lists publications of the League of Nations on international trade, exchange loans, and currency. Both of these publications are of value because it is a known fact that very good profits are made by many businesses from their foreign sales in contrast with those made in our highly competitive markets.

MALLEABLE FOUNDRY REFRACTORIES RECOMMENDATIONS. The U. S. Department of Commerce, Bureau of Standards, has published Simplified Practice Recommendations R79-28, for the elimination of waste through simplified commercial practice entitled "Malleable Foundry Refractories." This recommendation is effective February 1, 1928, and contains recommendations for door opening tile, tap out blocks, shapes for side walls and bridge walls, shapes for bungs and roofs, and shapes for round stacks. The pamphlet contains a list of associations and manufacturers accepting this specification. It can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., for 10 cents.

RESEARCH IN SALES MANAGEMENT. The Policy Holders' Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York City, has prepared for the Research Committee of the New England Council, booklet No. 5 of a series of reports on applying research to sales, entitled, "The Use of Research in Sales Management." Such topics as bettering production, reorganizing sales departments, sales supervision, and improving dealer relations are discussed and actual cases are presented. The facts were gathered during visits to over 300 New England companies. Copies may be obtained free from the publisher.

RESEARCH IN STANDARDIZATION AND SIMPLIFICATION. The Policy Holders' Service Bureau of the Metropolitan Life Insurance Co., 1 Madison Ave., New York City, has prepared, for the Research Committee of the New England Council, booklet No. 2 of a series of reports on applying research to production entitled, "The Use of Research in Standardization and Simplification." A brief history of the accomplishments of twenty-eight New England companies through research is contained in the booklet. The brochure is arranged in four sections, each representative of a particular method of attacking the combined problem of simplifying and standardizing manufacturing processes. The pamphlet may be obtained free from the publisher.

NEWS OF THE WEEK

Malcolm Muir Elected President of McGraw-Hill Publishing Co.

James H. McGraw remains as chairman of the board

RECENT growth and expansion of the McGraw-Hill Publishing Co. have led to action by the board of directors, it was announced on Nov. 1, separating the offices of chairman of the board and president of the company, both of which have hitherto been held by James H. McGraw. Under the new plan of organization Mr. McGraw will continue as chairman of the board.

Malcolm Muir
President of the McGraw-Hill Publishing Co.

Malcolm Muir, formerly vice-president, has been elected president of the company and chairman of its executive committee. James H. McGraw, Jr., vice-president and treasurer, has been elected vice-chairman of the board, and chairman of the company's newly-created publishing committee.

Through merger and purchase in recent months the McGraw-Hill Publishing Co. now comprises nine subsidiary and associated companies publishing business and industrial magazines, engineering books, catalogs and directories. Twenty-four magazines serving ten fundamental industries and covering business broadly are published at such widely distant points as New York City, Chicago, San Francisco and London. The direct effect of this co-ordination of related publishing interests will be to enhance publishing facilities for the group as a whole beyond those which any single paper or lesser group might enjoy. At the same time, the official announcement of the board of directors points out, these developments have greatly multiplied executive responsibilities and have necessitated a readjustment of the administrative duties of the company's principal officers.

Mr. Muir will be the chief executive of the McGraw-Hill Publishing Co., with full authority and responsibility for the operation of the company's business. He has been with the organization for the past 23 years and has been identified with many phases of its activities. During the past ten years particularly he has taken an active part in each step of the company's growth. He has been a leader in the work of the Associated Business Papers, serving as president in 1925-1926, and has been an important factor in raising the publishing standards of the business papers.

L. C. Morrow to Head *Industrial Engineering*

Effective Nov. 1 L. C. Morrow, for the past eight years Managing Editor of the *American Machinist*, took over the editorship of *Industrial Engineering*, another of the McGraw-Hill publications.

Mr. Morrow joined the staff of the *American Machinist* as associate editor in May, 1920, at the conclusion of his work as mechanical engineer with the Ordnance Department of the United States Government at the Eddystone (Pa.) Rifle Plant.

At Eddystone he was engaged in methods inspection in which it was necessary for him to examine critically every production and inspection operation involved in producing the components for the 6,000 United States Army rifles turned out daily from the Eddystone plant. At the conclusion of actual production he had charge of the inspection for disposal to other arsenals and for sale of the machine tool equipment and much of the material in stores; and prior to his leaving the rifle plant was assistant superintendent of storage, inspection, and shipping activities.

Preceding the work for the U. S. Ordnance Department he was engaged by the British Ministry of Munitions

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L. C. Morrow
Editor of *Industrial Engineering*

of War in the U. S. A. as assistant manager of the British methods inspection department at Eddystone.

This work was preceded by a year of traveling inspection for the British Ministry in passing upon the products of twenty or more worthwhile machine tool plants in the Middle-West and the East.

Mr. Morrow went to the British Ministry from the Lodge & Shipley Machine Tool Co. of Cincinnati, Ohio, where he had been employed in the advertising and sales department.

Prior to his connection with Lodge & Shipley he was engaged in time study and rate setting work with the Barney & Smith Car Co. of Dayton, Ohio, and before that was an instructor of industrial apprentices in the Cincinnati Continuation School. Before taking up the industrial school work he served the Root & Vandervoort Engineering Co., of Moline, Ill., as apprentice foreman and in connection with employment and time-study work.

Just prior to the Root & Vandervoort engagement he had completed a 5-year co-operative course in mechanical engineering at the University of Cincinnati, graduating in 1912 with the degree of Mechanical Engineer. During the five years he devoted 50 per cent of his time to foundry, machine shop, and erecting work in the plant of the Laidlaw-Dunn-Gordon branch of the Worthington Pump Co. at Cincinnati.

Mr. Morrow became a Junior member of the American Society of Mechanical Engineers in 1916 and was promoted to full membership in 1924. Dur-

ing the past three years he has taken an active part in the affairs of the Machine Shop Practice Division, as a member of the Executive Committee during 1926, and as chairman of the Executive Committee during 1927 and 1928, in which capacity he is now serving. He holds the chairmanship of the A.S.M.E. sub-committee on the standardization of Woodruff keys, and is a member of the American Society for Steel Treating.

A.S.M.E. Annual Meeting Program Announced

The complete program of the annual meeting of the American Society of Mechanical Engineers to be held in the Engineering Societies Bldg., New York City, December 3-7, has recently been announced. Those sessions of most interest to the metal-working industry are listed below.

Monday Afternoon, December 3, 2:00 P.M.

Machine Shop Practice (I)

Fixture Design:
Principles of Jig and Fixture Practice, JOS. W. ROE.

Applied Mechanics (I)

Deflection of a Round-End Strut Subjected to a Constant Moment or a Transverse Force at the Middle, JAS. E. BOYD.
Stress Distribution in Rotating Discs of Ductile Material After the Yield Point is Reached, A. NADAI and L. H. DONNELL.

Tuesday Morning, December 4, 9:30 A.M.

Machine Shop Practice (II)

Method of Motor Application and Controls on Lathes, C. L. CAMERON.
Motors for Planer Service, FORREST E. CARDULLO.
Motor Drives for Precision Grinding, R. E. W. HARRISON.
Application of Motors to Special Drilling and Tapping Machinery, J. H. MANSFIELD.

Applied Mechanics (II)

Graphical Methods for Least-Square Problems, E. O. WATERS.
An Investigation of Abrasion in Carbon Steels, M. SUZUKI.

Tuesday Afternoon, December 4, 2:00 P.M.

Machine Shop Practice (III)

Finishes in the Machine Shop:
Mechanical Applications of Chromium Plating, W. BLUM.
Carboloy and Tungsten Carbide Tools, SAMUEL L. HOYT.

Education and Training for the Industries of Non-College Type

Preliminary Findings of a Study of Intensive Types of Technical Education, ROBT. H. SPAHR.

Materials Handling (I)

Material Handling Problems in the Public Utility, JOHN C. SOMERS.
Progress Report of Materials Handling Division.

Tuesday Evening, December 4, 8:30 P.M.

Presidential Reception and Dance.

Wednesday Morning, December 5, 9:30 A.M.

Management (I) (Jointly with A.M.A.)

Basis for Evaluating Manufacturing Operation, L. P. ALFORD and J. E. HANNUM.

Wednesday Afternoon, December 5, 2:00 P.M.

Illumination (Jointly with Illuminating Engrg. Society)

Designing Buildings for Daylight, H. H. HIGBIE and W. C. RANDALL.
Artificial Lighting Provision in Building Design and Process Layout, WARD HARRISON.
Light as a Factor in Production, C. C. MONROE and H. A. COOK.

Wednesday Evening, December 5, 6:30 P.M.

Annual Dinner, Hotel Astor

Thursday Morning, December 6, 9:30 A.M.

Management (II) (Jointly with A.M.A.)

Outstanding Economic and Technical Factors Involved in Engineering of New Manufacturing Equipment, J. R. SHEA.
The Executive Function in Industry, ROBERT T. KENT.
Management Engineering in the Smaller Industrial Plants, J. E. DYKSTRA.

Aeronautics

Commercial Airplane Design, G. W. BELLANCA.
Relation Between Commercial Airplane Design and Commercial Uses of Airplanes, T. P. WRIGHT.

Lubrication

Journal Running Positions, H. A. S. HOWARTH.
Friction of Journal Bearings as Influenced by Clearance and Length, S. A. MCKEE and T. R. MCKEE.
Cooling and Lubrication of Cutting Tools, Reports of Sub-Committee on Cutting Fluids of the Special Committee on Cutting Metals.

Thursday Afternoon, December 6, 2:00 P.M.

Materials Handling (II)

Skid Handling of Interplant Shipment:
New Developments in Materials Handling, R. L. LOCKWOOD.
Viewpoint of Railroads, J. V. MILLER.
The Use of Skids for Water Shipments, H. E. STOCKER.
Viewpoint of Great Lakes Transportation Companies, G. B. WRIGHT.
Economic Aspects of the Shipment of Material on Skid Platforms, C. B. CROCKETT.
Skid Platform Shipment of Commodities, F. J. SHEPARD, JR.

Symposium on Mechanical Springs

Stresses in Heavy Closely Coiled Helical Springs, A. M. WAHL.
Fatigue and Fatigue-Corrosion of Spring Materials, D. J. MCADAM.
Telephone Apparatus Springs, J. R. TOWNSEND.
Progress Report of the Research Special Committee on Mechanical Springs.

Friday Morning, December 7, 9:30 A.M.

Iron and Steel

Heavy-Duty Anti-Friction Bearings, S. D. KOON.
Progress Report of Iron and Steel Division.

Woodworking Machinery

Ball Bearings as Applied to Woodworking Machinery, H. E. BRUNNER.
Lubrication of Ball-Bearing Woodworking Spindles, HARRY R. REYNOLDS.
The Application of Universal Chucks to Woodworking Machinery, E. A. ENGLUND.
Report of Special Research Committee on Saws and Knives, CARLE M. BIGELOW, Chairman.

British Industry Already Affected by Prospects of Next Elections

Manufacture of electrical goods now leads in activity

BY OUR LONDON CORRESPONDENT

NEXT year in the ordinary course a general election will be held in Great Britain, and its shadow is already to be seen, here and there, on industry and business. Politics of course can have no appropriate place in these columns, but it seems safe to say that the maneuvring for position that is evident on the part of those who would impose or oppose a system of protection in the country, or who would extend or abolish safeguarding duties, is having some little disturbing effect, and even in the machine tool industry it would be quite possible to name a firm that recognizes the need for a more efficient factory but yet postpones any definite decision to build until it is possible to see which way the political cat will jump. So far we have commonly held that politics has no great influence on the economic movement—the business of supplying needs and wants. But political uncertainty may easily form an excuse for vacillation and delay on the part of waverers. The ins and the outs are at it and if one set of politicians so decides, iron and steel may well be a battle-ground; indeed not a few members of the industry have been urging the need for special protection on one ground or another.

On the other hand, as has been reported, a rebate system has been instituted as applying to customers who undertake to use nothing but British commodities. As yet the effect of this scheme has not yet been made public, though imports have declined with levelling of prices. Some industries are being criticised for the use of out-of-date plant equipment and methods, and the directors have been told that not until new methods are used and new markets have been studied and explored can they approach any government on the ground that it is impossible to meet outside competition and that therefore they need special help. Certainly the organization of exports on co-operative lines is being discussed by a number of steel firms.

The manufacturing side of electrical engineering has on the whole for some time been about the most prosperous branch of engineering. It is true that exports during the earlier part of the current year did not quite reach the high level of the previous year. But of late there has been an improvement, although complaints may be heard that profits have been minimized owing to competition from the continent of Europe. On the other hand, the home trade may not quite be at its former height, despite considerable orders given out by the Central Electricity Board, particularly for cables and for transformers. In the home market some branches of electrical engineering have had to encounter the impression that price maintenance rings and agreements are operative. The various associations concerned have endeavored to refute this notion but their protests have not met with entire success.

The electrical industry, like several others, has been regarded as barometric —Sir Alfred Herbert lately made the same claim for the machine tool industry. As a trade barometer the statistical reports recently issued by the

British Electrical & Allied Manufacturers' Association are not quite as encouraging as formerly. While the normal state of increase in electrical power production is estimated to be of the order of 10 or 11 per cent., this year it has not reached 7 per cent. The entirely-relative decline has been more obvious since the first quarter of the year, the increase during the month of August being less than 5 per cent. The explanation is held to lie in trade depression, a suggestion which is certainly borne out by the official figures published from time to time regarding unemployment generally. In fact, according to the electrical manufacturers' report, what improvement there is, is measured by the increased use of electricity in certain shipbuilding and steel-producing areas.

The motor trade and industry, while holding its annual show in London, has similarly been reviewing its position. It is estimated that the total number of cars in use in 1928 is about 900,000, having risen from 787,000 in 1927. The estimate is one private car for about 56 persons in Great Britain in 1927, as compared, we are being told, with 5.8 persons in the United States. The potential ownership of cars is estimated at something like 1,000,000. Maintenance cost, garaging and taxation are held to be the chief present handicaps to ownership, and it appears to be thought that unless they can be reduced the purely home demand after the next year or two will show the effect. The production figures for 1928 are not yet available, but the total given for 1927 is 209,000, of which 157,000 were pleasure cars and 52,000 commercial vehicles.

At the London Motor Show this year, an increase in the number of six-cylinder cars and of straight-eight engines was noted.

THE MACHINE TOOL SHOW

At the recent Machine Tool Exhibition in London, the total number of machine tools shown by 57 firms amounted to 657; of them 132 were imported machines, the imports being, with but few exceptions, all American. These figures are based on a census taken by the European edition of this journal. They do not include machines used in order to demonstrate the cutting capacities of tools, or, of course, small tools. The total was higher than for the 1924 exhibition by about 45 units, but was distinctly lower than for the 1920 exhibition when 100 exhibitors, according to a similar census, showed 1,000 machine tools, of which 208 were imported.

One of the features of this year's exhibition was the further tendency to demonstrate machines on actual production work. The variety was so great that details cannot be given here, but it is possible to note that, apart from production work, a Stirk planer was cutting cast iron at 280 ft. per min., returning at 300 ft. per min., while endurance tests were made with Osborn S.O.B.V. cutting tools; here, in the presence of the writer, on 30-ton tensile steel, a 1-in. square tool, running dry, with a $\frac{5}{16}$ in. depth of cut and a feed of $\frac{3}{32}$ in., turned a total length of 13 ft. 9½ in., practically continuously, before the cutting edge was broken down, the initial cutting speed being 253½ ft. per min. and the material 11¾ in. diam. initially. The writer saw twist drills made of the same material drilling $\frac{1}{4}$ in. holes in cast iron 2 in. thick in $2\frac{3}{5}$ sec., a penetration rate of 50 in. per min., followed by the penetration of mild steel with the same drill at 20 in. per min. Similarly a 2 in. hole was drilled in the 2 in. cast-iron block and timed at 10 sec., that is at a penetration rate of 12 in. per minute.

Ludlum Steel and Krupp in Alloy Merger

The Krupp Nirosta Co., Inc., of Watervliet, was recently formed as a patent-holding and servicing company of the alloy steels made by the Krupps Works, of Essen, Germany, and the Ludlum Steel Co., of Watervliet, N. Y. An agreement has also been reached with the General Electric Co. by which the latter will manufacture in this country the German cutting metal, Widia, now being manufactured by the Krupp Works. It has similar properties to the General Electric product, Carboloy, recently announced. Nirosta steel, also developed by Krupp, is a stainless steel that is resistant to acids and high temperatures up to 1,800 deg. F. Arrangements have been made so that the licensees of the holding company will have a voice in the direction of its affairs. These companies include the Central Alloy Steel Corporation, of Massillon, Ohio; the Firth Sterling Steel Co., of McKeesport, Pa.; the Ludlum Steel Co., and others.

Edward Corning, president of Ludlum, will be chairman of the board of the new corporation, and H. G. Batcheller, vice-president of Ludlum, will be president. The executive committee includes J. M. Schlendorf, vice-president of Central Alloy; Richard Prosser, Otto von Schrenk and Mr. Batcheller. Other directors are F. J. Griffith, chairman of Central Alloy; Henry E. Cooper, vice-president of the Equitable Trust Co., and Harold O. Barker, of Jessup & Lamont. Dr. Rudolph Prussing and Heindrich Artz are representing the Krupp interests in the consolidation.

Bethlehem Steel Corporation Sets Safety Record

Accidents were reduced 25 per cent in the plant and mines of the Bethlehem Steel Corporation during the first nine months of the year, according to a recent statement. Due to intensive accident prevention work among the employees, the corporation improved its best safety record notwithstanding a rate of operation in excess of 1927. Fatal accidents were reduced 37 per cent. Over 70,000 persons are employed in the various plants.

American Standards Association Replaces A.E.S.C.

Unanimous approval by the 37 member bodies of the establishment of the American Standards Association to succeed the American Engineering Standards Committee, is announced by William J. Serrill, chairman of the Standards Committee, who now becomes president of the American Standards Association. Plans for the change in name and scope had been announced early in July. One of the most important results of the abandonment of the committee form of organization will, according to Mr. Serrill, be a much greater degree of participation by trade associations in the direction of the national industrial standardization movement.

One of the first acts of the association will be the organization of a board of directors composed of twelve industrial executives. This newly-created board, which was established in recognition of the increasing part which executives are playing in the standardization movement, will control the general administration and policies of the association. The old Main Committee, made up of representatives of all the member-bodies, now becomes the Standards Council, and in its hands will rest all matters connected with the adoption and approval of national standards.

The officers of the association are, in addition to Mr. Serrill: Vice-president, Cloyd Chapman; secretary, P. G. Agnew; and assistant secretary, F. J. Schlink. The advisory committee of Industrial Executives includes: J. A. Farrell, president of the U. S. Steel Corporation, chairman; George B. Cortelyou, president of the Consolidated Gas Co.; John W. Lieb, senior vice-president of the New York Edison Co.; L. F. Loree, president of the Delaware & Hudson Co.; and Gerard Swope, president of the General Electric Company.

Acetylene Association to Hold Sessions in Chicago

One of the features of the convention of the International Acetylene Association which is to be held in Chicago at the Congress Hotel, Nov. 14-16, is a discussion of the report of the oxy-acetylene committee of the association, giving a comprehensive survey of the uses of this type of welding and cutting. The technical sessions include discussions by prominent engineers on such subjects as: The Use of Acetylene in Transportation; The Use of Acetylene in Times of Emergency; The Cutting of Structural Steel; Bronze Welding of Steel; Acetylene in the Manufacture of Refrigerating Apparatus; Hard-Facing Metals; Non-Ferrous Alloys; Mechanical Welding; The Effect of Tip Size and Pressure on Economy of Cutting; and Welding Industrial and Domestic Piping.

The Business Barometer

The outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE

Editor, Commerce and Finance, New York

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THE news that the world will shortly be provided with a telescope that will reveal stars that are a billion light years away from the earth is such an infinite extension of the human vision that it is entirely beyond our comprehension. It is accepted as possible, however, just as are the many amazing predictions of our economic prosperity that are now to be heard on every hand.

But the fact is that we are in an era of credulity fostered by the miracles that physical science has already achieved in transportation, dynamics and chemistry. The airplane and the dirigible, hydro-electric power and chemical research, have made it possible for man to accomplish so many wonders, and accumulate wealth so rapidly, that we have ceased to be surprised at anything, and are willing to believe almost any story that we are told.

This is an attitude of mind that should not be disregarded by the student of business conditions, and unless something occurs to change the prevailing mood, it seems likely to re-assert itself after the election, irrespective of whether the Democrats or the Republicans succeed. This was made evident last week when the stock market turned up again, despite the caution of the conservatives, and the liquidation of the prudent minority.

The output of new securities continues. One recently-formed investment trust sold fifty million dollars of its preferred stock in a day. Many smaller issues were eagerly absorbed, and while call money rose to 7½ per cent, the advance seemed to be without affect upon either the mind or the purchasing power of a world that appears to have become unanimously optimistic about the future of America and Canada.

In such a situation there is nothing to do but watch and wait, unless one has the temerity to join the innumerable throng of those who are acting on the innumerable tips that are distributed so indiscriminately on the various stock exchanges throughout the country.

Including the Produce Exchange in New York and the Chicago Board of Trade in Chicago, where securities will soon be traded in, these stock exchanges now include 33 different institutions, in some of which a very large business is handled. Seats on the San Francisco Stock Exchange have, for example, recently sold for as much as $200,000, and $125,000 was paid last week for a membership in the Los Angeles Exchange.

The credit required to finance a speculation that is becoming international as well as national, runs into enormous figures, and only a part of it is represented by the brokers' loans that are reported to the Federal Reserve Bank of New York. As of last Thursday, these loans amounted to $4,907,164,000, and showed an increase of $135,000,000 for the week. But this increase was ignored except by those who acclaim it as an evidence of American opulence and prosperity.

WHAT'S DOING IN INDUSTRY

OCTOBER sales of machine tools have been maintained at a high level in nearly all industrial centers of the country. Chicago reports the month's business as a record one, Buffalo that it was the most active month in the last four, and Detroit that the month was unusually good. October sales of machinery in Philadelphia have been above expectations, and in New England and Cleveland have been on a par with those of September, an excellent month for the trade. Milwaukee, however, reports a good demand, but slower than for the last two months. The situation in New York has remained unchanged, being at a high level for some time.

THAT sales to automotive plants have been a big factor in the market is evident in all quarters, but purchases from this source are beginning to prove embarrassing in other respects, particularly in regard to delivery to other buyers. With most of the well-established machine tool plants working overtime, deliveries are now being quoted as much as eight weeks ahead. The automotive demand has been the most insistent with resultant waiting by less aggressive customers. To offset this condition, however, Philadelphia dealers report that several orders have been placed recently for delivery six months hence.

OTHER buying remains extremely diversified, in small lots, but with a large aggregate volume. The demand is such that present activity is expected to last for many months. Used equipment is finding the best market in some time.

Of course, there is another side of the picture; but it is so obvious that it is unnecessary to present it at a time when ordinary financial prudence is classed as unpatriotic. In a period when what might be called "super confidence" is so wide-spread, it is quite natural that distributive trade should be active, and it is surprising that there is so little speculation in commodities.

Car loadings, retail sales, and all the conventional statistics indicate that the necessaries, as well as the luxuries, are being freely bought, but none of the staples show a marked advance in price, and some of them declined during the week. Sugar caused something of a sensation by declining to the lowest price in the history of the New York Sugar Exchange, and it has attracted widespread attention as a speculative investment.

Rubber has moved within narrow limits. Rubber enjoys a "free market" once more, as the British restrictions on shipments from the plantations were removed November 1; but the event had long since cast its shadow on the market and was without additional effect. Copper is about the only important article that has advanced. It is up to 16 cents, but as those who control the market have it well in hand, no skyrocketing is expected.

Pig iron has taken the lead in the ferrous market and October's daily output was the largest in 17 months, yet demand exceeds supply. The steel industry continues buoyant and the month's production promises a seasonable record. The automobile trade is again breaking records for this time of the year and in most other lines manufacturers have ceased to talk of over-production. This is particularly true of the textile industry. The mail-order houses report for October the biggest month's sales in their history.

But further details are unnecessary. Business in nearly every line is undeniably good, and the improvement seems likely to continue until the off-take is checked by an advance in the prices demanded for the essentials of life. In the past such an advance has always been a concomitant of increased activity, and if it fails to take place in the present instance, the arrival of a new era can be argued with great plausibility.

Meantine, American business is provided with the "makings" of a Merry Christmas, as well as a bountiful Thanksgiving dinner, and we ought to have a Happy New Year.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CLEVELAND

After a slight slowing-up spell during the middle of October, sales of machine tools again showed a pick-up during the latter part of the month with a result that business for October will be on a par with September, which was considered to be one of the best months of the year. There is a little hesitancy on part of some buyers to await the result of the election before closing orders.

A diversified market is buying at the present time. Purchases indicate a general stepping up in all lines. Orders are usually for one piece or small lots, the aggregate of which is summed up for a good profit. Metal-working, automotive, airplane and tractor manufacturers are consistant buyers. Automatic machine business shows steady improvement. An increase in orders is noted for the past ten days compared to the previous ten. The biggest portion of this business is coming from the automotive industry. Immediate delivery specifications has necessitated night shifts in order to speed up deliveries. An increase is noted for heavy-duty equipment, particularly shears, lunches and similar tools.

CHICAGO

The month of October closed with a record of machine tool business transacted that surprised even the most optimistic of those engaged in the industry. September's business was thought to have reached so high a mark that it probably would stand as a record for the year, but from all reports received, in the total volume of sales it was surpassed by October. Interviews with some of the leading machinery interests representatives elicited the opinion that the same high level that has characterized the last three months probably would continue throughout the year; beyond that they would make no forecast.

With the exception of the farm implement and tractor industries, the automotive and allied industries are credited with having probably been the leading factor in the activity that has recently prevailed in the machinery market, although industrialists have been extensive buyers. The activity in machinery circles has been shared also by dealers handling used tools, the demand for this class of machinery having been exceptionally brisk during the last several weeks. One of the large handlers of used tools in this market stated that his sales during September and October this year almost equalled those of the six months preceding.

BUFFALO

October proved to be the best month in the last four months in the machine tool trade in Buffalo. Some report it to be the best month of the year. This is general in all fields with the exception of the contractors' supply field, which has suffered because of early rains which stopped road building and bridge construction work prematurely for the season.

For the first time in several months there has been some local buying on the part of steel companies, particularly of electrical equipment. The Bethlehem Steel Co. is rebuilding ore trestles and installing modern ore unloaders. The M. A. Hanna Co. has made extensive purchases in the modernization of the Rogers-Brown plant. The Donner Steel Co. has also made some improvements.

Most of the orders in the electrical equipment field as well as the general machine tool field are small but, coming from a wide variety of industries, they bulk large. They indicate a widely prosperous condition.

Inquiries tapered off at the end of October. A few believe that this portends a reduction in buying until after the first of the year as many of the inquiries ask for quotations for 1929 delivery, but the general impression still seems to be that the last two months of the year are going to be good.

CINCINNATI

The great majority of the machine tool manufacturers in the Cincinnati district report an increased volume of sales in the past week and state that there was improvement in the general market tone. All report that in the week business was at a good level and none report a falling off of orders. Several who had just returned from the East report that in that section they found conditions encouraging.

Selling agents report that they had a good demand in the week and made some gain over the previous similar period. The market tendency, it is stated, is upward in local and adjacent territory.

Orders for single tools predominated, with scattered orders calling for two or three pieces of equipment. The purchases were well diversified in the matters of sizes and types, and source. An increased number of orders came from the automotive industry and its allied trades, principally for single tools.

Inquiries came in freely during the week, an increased number of inquiries coming from makers of automobiles, parts and accessories. This fact gives hope that this market is about to grow better.

The increasing demand is creating a shortage of skilled machinists, and for this reason it is being pointed out that all who are in need of tools should place their orders at once, lest there be a delay.

PHILADELPHIA

October sales of machinery, machine tools and allied equipment exceeded the expectations of dealers and manufacturers in the Philadelphia area. Business was on an upgrade throughout most of the month in a majority of lines, although in others there was a slight falling off. Some of the dealers reported their problem to be that of long-delivery, some purchasers asking delivery as late as six months from the date of ordering.

Producers of ball bearing equipment reported a brisk business during the last thirty days, with orders from automobile manufacturers, woodworking machinery plants and milling machine producers. There has been some railroad buying of lathes, shapers and milling machines, and mechanical equipment for general industrial plants has moved in satisfactory volume.

Taken as a whole, the business situation in this market appears to continue on the same satisfactory foundation as was indicated two weeks ago. Inquiries, also, have been hopeful and from a well-scattered area, coming from general industrial lines. The announcement of the Pennsylvania R.R. on Nov. 1 that it plans an expenditure of $100,000,000 for electrification of its freight and passenger lines between Wilmington, Del., and New York was the most important industrial news of the last fortnight. The expenditure will be at the rate of about $15,000,000 a year. The company's board of directors has appropriated funds for the initial work between Philadelphia and Trenton.

NEW ENGLAND

Machine tool and machinery sales the past week fell slightly from a level maintained through the month of October. New orders during the last month were exceptional in number in lieu of the heavy order balances already on the books of many metal-working-equipment manufacturing plants. Statistics for the month show several plants have booked orders below September totals, but more plants may be figured to have done as well and some better. As near as can be judged, it is fairly certain October business was about on a par with September.

Unfilled orders keep production schedules at tops. Time required for delivery of prospective orders, as quoted, is longer, and gives further indications of the predominating activities in the New England territory. In view of heavy buying more or less apparent for several months, it is expected a breathing spell is likely at any time.

Automotive, aeronautical and electrical interests are consistent buyers. The Holmes Products Co., Bridgeport, is speeding up production and is adding equipment for the manufacture of a second electric refrigerator to be known as the Holmes. The Pratt & Whitney Aircraft Co., Hartford, is stepping up production to supply 25 Wasp engines monthly to the Ford Motor Co., Detroit, for the Ford tri-motor planes, to be manufactured soon at the rate of one plane a day. This additional production of engines taxes the Pratt & Whitney plant to its present limit.

MILWAUKEE

While the pace of machine tool demand has slowed up somewhat, in comparison with the brisk activity of the past eight to ten weeks, there still is a good demand. At the same time, most shops manufacturing metal-working equipment are obliged to continue production on a capacity basis, with some working night shifts in an effort to make prompt deliveries on orders. This is particularly true of needs placed by automobile factories in recent weeks.

These plants appear, for the most part, to have purchased the greater share of equipment needed to round out production plans for the remainder of the fall and the winter months. Here and there a supplemental order for one or a few items is being placed, but round lot business again has become rare. However, it will take shops having such business until the beginning of the new year to complete deliveries, with some shipments hardly possible before the end of January.

Meanwhile general industrialists are doing considerable buying and as old orders are shipped, new ones come in at a rate practically equaling shipments. Sources of new business are unusually diversified and the types of equipment being purchased are commensurately broad in character, covering a wide range of purposes.

Employment in the metal-working industries in this locality continues at a high rate, with no relief appreciable in the shortage of workers. Comment on the general business situation is soundly optimistic, and the outlook for the metal trades is deemed promising as well. With the pres-

idential election out of the way, business men of all classes expect further impetus to a progressive growth of trade volume.

DETROIT

October proved to be an unusually good month for dealers in machinery and machine tools, and from every indication November will be almost as good. Business here has maintained the record level set early in the year, and with the exception of a few weeks in the summer the volume of business has been more or less remarkable. One of the outstanding features of the past month has been the extreme diversification of business. Every type of machinery, tools and equipment was in demand.

All of the small shops are very busy and some of them are so far behind that they are no longer accepting orders. The better shops are working night and day, and some of them are busy seven days a week. Part of this is, of course, due to the fact that Ford is letting out so much work on contract, but this is by no means the only factor. The Dodge plant, Kelsey Wheel, Ford, and a number of others are making expansions and changes. Many of the manufacturers are working on new models.

General business conditions here are excellent and there is no indication that things will soon change. Employment is still way up, and, though it is not gaining as it did all year, it is maintaining its unprecedented level.

NEW YORK

October business in machine tools on the whole has been maintained at about the same level as for the previous month, and the remaining two months of the year are approached with considerable confidence. No single outstanding order has been placed, but a good volume of diversified orders continue to come in. Some dealers reported a slight falling off in orders in the past week, but no significance is attached to this because of the large amount of prospective purchases. A representative handling lathes stated that the past month had been one of the most active this year, and two other companies selling throughout the country reported extremely active sales during the month. An inquiry for a number of machines for export to South America is noted.

The delivery situation is beginning to prove embarassing to many local dealers. With most of the well-established machine tool factories working overtime in an attempt to catch up with present demand, deliveries are now being quoted as much as eight weeks ahead, and some orders have been lost on this account.

Sales made by the Triplex Machine Tool Co. included: a Mikron gear hobber, a Campbell nibbler, a 14-in. x 6-ft. Springfield lathe, an Ames miller, a small bench miller, an arbor press, and a small high-speed drill press. The month's business has been above the average.

The Pratt, Whitney Co. reports the sale of four jig borers, eight toolroom lathes, two bench lathes, two 6-in. vertical shapers, a profiler and a die sinker. The Niles Tool Works Co. sold a 79-in. driving-wheel lathe, four 4-spindle drum-type millers, one 8-spindle drum-type miller, and a 30-in. x 20-ft. Time Saver lathe. The machinery division sold a Burke tapper, a Cincinnati high-speed bench tapper, a B. & S. universal grinder, three Ransom grinders, a Cincinnati high-speed drill, a Niles-Acme shaper, two 3-ft. Morris radial drills, a Long & Allstatter I-beam punch and a Marshalltown rotary shear.

Great Lakes Aircraft Acquires Martin Plant

The Glenn L. Martin Co. has sold its plant and manufacturing equipment located at Cleveland, Ohio, to the Great Lakes Aircraft, Inc., according to a statement made by Glenn L. Martin. The Martin company has licensed the Great Lakes concern to manufacture planes and spare parts for Model 74T4M-1T3M-2 and CS types, and both military and commercial planes will be built at Cleveland.

The Martin company will move to a new site on the Atlantic Seaboard, presumably Baltimore, Md., by January 1, and will construct there the first unit of a new plant of 300,000 sq.ft. fully equipped with new machinery. When in full operation the plant will employ about 2,400 men. New models are to be developed and placed in quantity production. A large part of the present Martin organization, including department heads, assistants and workmen, will be moved to the new plant. A sufficient number of trained men, however, will remain at the Cleveland plant to provide a nucleus for the new Great Lakes organization.

William Robert Wilson, banker and automobile industrialist, is chairman of the board of the Great Lakes Aircraft, Inc. He is now president of the Guardian Trust Co., of Detroit. In 1911 he was with the Studebaker Corporation, and from 1913 to 1918 was in charge of production for Dodge Brothers. For a time he was vice-president of the Irving National Bank, of New York, and later headed the reorganization of the Maxwell Co. under Walter P. Chrysler. In 1925 he joined the Guardian Trust as president. He is also president of the Copeland Products Co. and recently resigned the presidency of the Murray Corporation of America.

Fokker Expansion Program

Prominent Pacific Coast financial and aviation interests have assumed control of the Fokker Aircraft Corporation, one of the leading producers of standard planes in the United States, and a multi-million dollar aircraft program, including production, sales and operation are planned. The present Fokker factory sites at Teterboro Airport, Hasbrouck Heights, N. J., and at Wheeling, W. Va., will remain in operation. A third unit is to be built in California. It is planned to establish a through air line from the Pacific Coast to the Mississippi River, and one of the immediate problems will be to construct airplane sleepers for this service. James A. Talbot, president of the Richfield Oil Co. of California, becomes chairman of the board, and Harris M. Hanshue, president and general manager of the Western Air Express, becomes president and general manager of the manufacturing concern.

McClintic-Marshall to Operate Buffalo Plant

The McClintic-Marshall Construction Corporation has taken over the operation of the bridge plant of the Bethlehem Steel Co. at Buffalo and will build there ships and locomotives. The Pittsburgh concern of the same name is a $12,000,000 corporation and the new firm was recently incorporated to operate the Buffalo plant. The Buffalo branch is capitalized at 5,000 shares of no-par value stock. Charles D. Marshall is president and among the incorporators are Elbert E. Gibbs and Earle J. Patterson of Pittsburgh.

Business Items

The United Metal Manufacturing Co., Inc., Norwich, Conn., has incorporated to take over the business of the same name.

The Caterpillar Tractor Co., of California, has acquired the Russell-Grader Manufacturing Co., of Minneapolis, effective January 1.

The Chase Brass and Copper Co., of Waterbury, Conn., is planning to build a new brass and copper plant in Cleveland. As soon as definite location of the site has been made, the erection of buildings will commence.

Letters of incorporation have been issued to Ryerson, Inc., 2558 W. 16th Street, Chicago. Capital 435,000 shares, non-par value. Business of dealing in metals, iron, steel, etc. Incorporators: Jos. T. Ryerson, Donald M. Ryerson and Edward L. Ryerson, Jr.

The Delco-Remy Corporation, at Anderson, Ind., has recently acquired the rights to manufacture the Electrolock for locking automobiles, according to C. E. Wilson, president and general manager. The corporation now has three locks on its list of products.

The New York Car Wheel Co. has bought a substantial interest in the Houde Engineering Co., Buffalo, manufacturer of the Houdaille shock absorber. F. B. Cooley, president of the car wheel company, is expected to become chairman of the board of the Houde concern.

A new Prest-O-Lite gas plant located in Birmingham, Ala., began operations on Oct. 16. The Prest-O-Lite chain now numbers 34 plants. A. J. Topham is plant superintendent, and G. A. Andrews, with headquarters at the Birmingham plant, is district superintendent.

The Formica Insulation Co., Cincinnati, Ohio, has recently completed an addition to its factory of 18,000 sq.ft. Of this, 2,000 sq.ft. have been devoted to a laboratory. Other parts are to be used for increased capacity of the gear department and for treated material.

Announcement has been made that the Holmes Foundry Co., Ltd., of Port Huron, is to reopen its Sarnia (Ontario) plant about Dec. 1, after 18 months idleness. About 125 men will be employed, and the plant will manufacture automobile parts on contract. L. M. Mullholland, formerly general foreman, will be plant manager.

An $80,000 extension to the General Motors of Canada stamping plant at Oshawa, Ontario, which will double the capacity of that section of business, will be erected in the near future, according to W. E. Davis, assistant general manager. This new section, it is stated, means the employment of 300 additional men.

Edgar T. Ward's Sons Co., distributor of cold finished steels of all kinds, with warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston and Newark, has opened a warehouse in Milwaukee in a new building it has erected at 57th Ave. and Burnham St., West Allis. Fred O'Dell has been placed in charge as branch manager.

The Fairchild Aviation Co. of Canada will, in the very near future, manufacture its own planes in Canada, it is announced by L. J. Dalton, general manager, who states that a new half-million dollar plant will be erected at Grand Mere, Que., operations to begin early in 1929. Production will probably be at the rate of five or six planes a week.

Dominion Foundries and Steel, of Hamilton, Ont., will begin deliveries of steel plates on November 15 from a mill which, while completed in the closing months of the war, never made a plate. The investment was in excess of $2,000,000. The company has been operating its foundry

at a gradually increasing profit but the idle plate mill has been a serious drag.

The Mississippi Iron Works, Ltd., has decided to transfer its plant from Almonte, Ont., to Hull, Que. When a flood last spring carried away part of the factory wall of the Almonte plant operations were suspended. The company was established in Almonte in 1875 and since then has manufactured agricultural machinery, chiefly fanning mills, and grain and seed separators of various kinds.

A delegation of French mechanical engineers are to visit the plant of the Pratt & Whitney Co., Hartford, Conn., on November 13. Robert Grimshaw, New York industrial engineer is chairman of the committee on arrrangements. A British and German delegation are planning a similar trip to the Pratt & Whitney Company, but will extend their trip to include visits to several other unnamed plants.

The Speed Changing Mechanism Co., Indianapolis, Ind., has recently been formed to market a new type of automotive transmission invented by Burrell Dorsey, mechanical engineer. The invention does not differ radically from former designs except that the clutch pedal is eliminated and the shift lever is retained as the only means of shifting necessary, the gears being always in mesh.

In order to adequately take care of its expanding business, the Aetna Ball Bearing Manufacturing Co., 2745 High Street, Chicago, has moved into a two-story and basement factory building located at Parker and Schubert Avenues, fronting on the right of way of the C. & N. W. R.R. and Kilpatrick Avenue. The company has acquired the ownership of this property, which occupies a ground space of 240 x 149 feet.

The Banner Manufacturing Co., 1873 Clybourn Ave., Chicago, will give instructions in the design of cams for B. & S. automatic screw machines on the first and third Fridays of November, December, January, and February. There will be no charge for these instructions, which will include work on the small cut-off type to the highest type of cam design used today. The Banner company cuts cams for the B. & S. machines.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., is planning to develop a new automatic rifle under government specifications. Competitive tests with other companies' products will be arranged and the rifle meeting government requirements will be adopted by the Ordnance Department. This rifle is expected to replace the Springfield rifle now used by the army and will embody combined features of that rifle and the Browning rifle.

Articles of incorporation have been filed by the L. S. Guetti Tool Co. of Marion County, Indianapolis, with a home office in Indianapolis. The corporation has an initial capital stock of 1,750 shares of no-par value common stock and $35,000 of preferred stock. The corporation is formed "to conduct the business of manufacture and sale of all kinds of tools, gages, appliances, devices, machines and machinery." The incorporators are L. S. Guetti, R. M. Guetti and Henry Maroni.

The New York sales office and display room of the C. F. Pease Co., of Chicago, formerly located in the Grand Central Terminal, has been moved to new quarters in the Ashforth Building, 12 E. 44th St., New York City. Because of the increased floor space in this new location, this office, under the direction of T. K. Murney, Eastern sales manager, has improved facilities for stock and display of a complete line of blueprinting machines and drafting room furniture. An increase in sales personnel has also been made.

The Roseland Can and Wire Goods Co. plant, 612 Harrison Avenue, Rockford, Ill., has been purchased by the Super-Maid Aluminum Ware Co. of Chicago, which is installing machinery in the new location and will open its first branch outside of Chicago with a force of 30 employees. The Super-Maid firm operates a foundry and two large factories in Chicago and plans to expand the local industry as business warrants. A. W. Andrews, superintendent of the Roseland Can and Wire indicated that the company may establish its plant elsewhere.

Expansion of its manufacturing facilities, which will double the present number of employes, was announced last week by Fred W. Swanson, president and manager of the Globe Machinery & Supply Company, Des Moines, Iowa. The company is preparing for the production of a new hydraulic air hoist for garages and service stations and is adding a new furnace coil, to its established lines of air lifts for dumping trucks and wagons, bathroom fixtures, etc. The firm, which was established 35 years ago, is one of the oldest and largest industrial and mill supply firms in the state and reports for the first nine months of the present year business in excess of any full year since 1920.

Personals

WILLIAM MCBRIDE, president of the Fort Pitt Spring & Manufacturing Co., Pittsburgh, on October 31 resigned.

SIDNEY J. NEWMAN has been elected president of the Newman Manufacturing Co., Cincinnati, succeeding Samuel Newman, who died recently.

EDWARD T. MONROE has been appointed general purchasing agent of the Buffalo, Rochester & Pittsburgh R.R., Rochester, N. Y., with headquarters in that city.

DR. H. RIES, head of the department of geology, Cornell University, has been selected technical director of the Committee on Molding Sand Research of the American Foundrymens' Association.

D. A. MERRIMAN, vice-president and general manager of sales of the American Steel & Wire Co., Chicago, was recently re-elected president of the American Hardware Manufacturers' Association for a third term.

W. W. NICHOLS, assistant to the president of the Allis-Chalmers Co., New York, in a recent speech in Indianapolis, urged the adoption of a code of business ethics to do away with present price-cutting wars and cut-throat competition.

HOWARD E. OBERG, who has been representing the machinery division of the Billings & Spencer Co. for several years in Detroit, has been called in to the main office at Hartford, Conn., to become sales manager of the machinery division.

JOHN A. MANLEY, for the past three years manager of sales development for Fairbanks, Morse & Co., Chicago, has been elected vice-president in charge of sales. Mr. Manley was formerly manager of accounts for the advertising agency of Henri, Hurst & McDonald, of Chicago.

FRANK B. LUTMAN of South Bend, Ind., has taken a position as works manager at the plant of the Columbus (Ind.) Handle and Tool Corporation. Before taking the new position he was with the production department of the Studebaker Corporation and before that with the Marmon factory in Indianapolis.

J. V. FRANKLIN, salesman with the British office of Black & Decker, Ltd., is visiting the United States. He will spend some time at the plant of the Black & Decker Manufacturing Co., Towson, Md., and in various automotive and industrial centers. He will also visit the Automotive Equipment Association Show in Chicago.

PROF. A. I. LIPETZ, consulting engineer of the American Locomotive Co., Schenectady, N. Y., and a non-resident professor of locomotive engineering at Purdue University, West Lafayette, Ind., visited the university recently for five days of lectures. The series started at an informal dinner meeting at which he discussed railway conditions and engineering education in Europe.

ELMER A. SPERRY, chairman of the board of the Sperry Gyroscope Co., Brooklyn, noted engineer, inventor and manufacturer, has been elected president of the American Society of Mechanical Engineers. He is credited with four hundred patents or inventions in mechanical, electrical and electro-chemical fields, including the gyro-compass and the gyro-stabilizer.

T. M. MCKEOWN has been appointed assistant general purchasing agent of the Canadian Pacific Railway, with headquarters at Montreal. Mr. McKeown entered the Canadian Pacific service in 1909 and in May, 1911, he was appointed clerk to the purchasing department of the railway, at Quebec. At the time of his recent appointment he was purchasing agent at Vancouver.

F. C. BIGGERT, formerly president of the United Engineering & Foundry Co., Pittsburgh, is now vice-president and senior engineer of the company. George T. Ladd, vice-chairman of the Combustion Engineering Corporation has been elected president in his place. Mr. Biggert wished to be relieved of the executive management of the company in order to devote his entire time to engineering and research matters.

Obituaries

LAWRENCE A. BARRETT, of the Oilgear Co., Milwaukee, Wis., died on October 31.

GEORGE P. MERRILL, secretary-treasurer of Mitts and Merrill, Saginaw, Mich., died on October 14.

RICHARD DEVENS, engineer with the Link-Belt Co., Chicago, died on Nov. 3 in his 63rd year.

JOSEPH P. DEVINE, president of the J. P. Devine Co., Buffalo, manufacturer of chemical and vacuum drying apparatus, died Oct. 28, at Buffalo.

ARTHUR E. PARSONS, 61, general manager and treasurer of the Brown-Lipe Gear Co., Syracuse, N. Y., died on October 31 in a Pullman enroute from Cleveland to Syracuse.

F. BIRGER KLEIN, aged 65, who for several years was in charge of research for the Union Switch & Signal Co., Swissvale, Pa., died Oct. 26 at his home in Wilkinsburg, Pa. He began work with the Union Switch Company 42 years ago.

WALTER W. NOWAK, European manager of the Niles-Bement-Pond Co. and the Pratt & Whitney Co., died in Paris on November 1. He had been with the affiliated companies since his graduation from Cornell University in 1905, representing them at first on the Pacific Coast and later in Chile, Argentina and Brazil. While in Chile, he secured the contract for the equipment of the Central Repair Shops of the Chilean State Railways, at that time the finest installation of the kind in South America. For the last ten years, he had been in entire charge of the European business of the companies with headquarters in London and Paris. Mr. Nowak was one of the best-known American machine tool representatives in Europe.

Forthcoming Meetings

American Management Association. Autumn convention, Palmer House, Chicago, Nov. 13-15. W. J. Donald, managing director, 20 Vesey St., New York City.

Iron and Steel Division, American Society of Mechanical Engineers. Second national meeting, Chicago, November 14-15. Thomas Wilson, chairman of Chicago local section host, 7 S. Dearborn St., Chicago.

Society of Automotive Engineers. Production meeting, Book-Cadillac Hotel, Detroit, Mich., Nov. 22-23. Coker F. Clarkson, secretary, 29 W. 39th St., New York City.

American Society of Mechanical Engineers. Annual meeting, Engineering Societies Bldg., New York, week of Dec. 3. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

Seventh National Exposition of Power and Mechanical Engineering. Held at Grand Central Palace, New York, N. Y., week of December 3.

Power Transmission Association. Annual meeting, Hotel Commodore, New York City, Dec. 6. Association headquarters, 644 Drexel Bldg., Philadelphia.

Western Metal Congress and Western States Metal & Machinery Exposition. Held in Los Angeles, Jan. 14-18, under the auspices of the American Society for Steel Treating. W. H. Eisenman, secretary, 7016 Euclid Ave., Cleveland.

The Weekly Price Guide

Rise and Fall of the Market

ONE indication of a slight easing in the steel price situation is the decline, during the week, of 25c. per ton in heavy melting steel scrap at Pittsburgh. This decrease represents the turning point in scrap, following a steady rise of three months' duration. There is also a seasonal decrease in demand for automotive material. Buying, however, continues fairly heavy in fabricated structurals, freight car and track materials, rails, bars and steel pipe. Pig-iron prices hold firmly to quoted levels with volume of sales steady. In non-ferrous materials there is an upward trend in fabricated brass and copper, also various descriptions of scrap. Black sheets are 5c. per 100 lb. under last week's quotation at Pittsburgh, while solder and babbitt metal declined ¼c. per lb. at New York.

(All prices as of Nov. 2, 1928)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$19.94
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.12
BIRMINGHAM	
No. 2 Foundry	16.25
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.26
Virginia No. 2	27.17
Basic	20.76
CHICAGO	
No. 2 Foundry local (silicon 1.75@2.25)	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.51
PITTSBURGH, including freight charge ($1.76) from Valley:	
No. 2 Foundry	19.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50
Cleveland	5.00
Cincinnati	4.30
New York	5.25
Chicago	4.50@4.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.00@2.10	3.35	3.25	3.90*
No. 12	2.05@2.15	3.40	3.30	3.95*
No. 14	2.15@2.25	3.45	3.35	4.00*
No. 16	2.25@2.35	3.55	3.45	4.10*
Black				
Nos. 18 to 20	2.55@2.65	3.60	3.30	4.00
No. 22	2.70@2.80	3.75	3.45	4.15
No. 24	2.75@2.85	3.80	3.50	4.20
No. 26	2.85@2.95	3.90	3.60	4.30
No. 28	3.00@3.10	4.05	3.75	4.45
Galvanized				
No. 10	2.70@2.80	3.95	3.65	4.25
Nos. 12 to 14	2.80@2.90	4.05	3.75	4.35
No. 16	2.90@3.00	4.15	3.85	4.45
No. 18	3.05@3.15	4.30	4.00	4.60
No. 20	3.20@3.30	4.45	4.20	4.75
No. 22	3.25@3.35	4.50	4.25	4.80
No. 24	3.50@3.60	4.65	4.35	4.95
No. 26	3.65@3.75	4.90	4.60	5.20
No. 28	3.90@4.00	5.15	4.85	5.45

250 to 3,999 lb.

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in., butt welded	50%	36%	55½%	43½%	54%	41%
2½ to 6 in., lap welded	45%	32%	53½%	40½%	51%	38%

WROUGHT-STEEL PIPE LIST

Size, Inches	List Price per Foot	Diameter in Inches—External	Diameter in Inches—Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at New York warehouse in lots of less than 100 ft. or 100 lb.:

Thickness—Decimal	B.w.g. and Fractions	Outside Diameter in Inches—⅛	¼	⅜	½	1	1½	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
.134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse base prices in cents per lb.:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	4.65	4.65
Spring steel, heavier	4.00	4.00	4.00
Coppered Bessemer rods	6.05	6.00	6.20
Hoop steel	4.50‡	4.00	4.15
Cold rolled strip steel	6.25	6.00	6.10
Floor plates	5.10‡	5.30	5.00
Cold drawn, round or hexagon†	3.40	3.65	3.60
Cold drawn, flat or square†	3.90	4.15	4.10
Structural shapes	3.30‡	3.00	3.10
Soft steel bars	3.25‡	3.00	3.00
Soft steel bar shapes	3.25‡	3.00	3.00
Soft steel bands	4.00‡	3.65	3.65
Tank plates	3.30‡	3.00	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

*Flat, ⅛@½-in. thick. †Cold finished steel, shafting and screw stock. ‡250 to 3,999 lb., ordered and released for shipment at one time.

Electric welding wire, New York, ⅛, 8.35c.; ¼, 7.85c.; ⅜ to ½ 7.35c. per lb.

METALS

Warehouse Prices in Cents Per Pound for Small Lots:

Copper, electrolytic, New York			16.25
Tin, Straits, pigs, New York			51.50
Lead, pigs, E. St. Louis	6.32½	New York	8.00
Zinc, slabs, E. St. Louis	6.25	New York	7.75

	New York	Cleveland	Chicago
Antimony, slabs	13.50	14.75	14.25
Copper sheets, base	24.62½	25.00	24.25
Copper wire, base	21.25	21.25	17.50*
Copper bars, base	23.12½	23.50	23.25
Copper tubing, base	26.00	26.37½	25.75
Brass sheets, high, base	20.25	20.50	20.00
Brass tubing, high, base	25.12½	25.37½	24.87½
Brass rods, high, base	18.00	18.25	17.75
Brass wire, high, base	20.75	21.00	20.50

*At mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum ingots, 99%	25.00*	24.30	24.30
Zinc sheets (casks)	10.00@10.50	11.00	10.01
Solder (½ and ½)	34.25	33.00	31@34

Babbitt metal, delivered in case lots, New York, cents per lb.:

Genuine, highest grade	66.75
Commercial genuine, intermediate grade	53.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	12.25

Nickel, f.o.b. refinery, Bayonne, N. J., cents per lb.:

Ingots	35.00	Electrolytic	37.00
Shot	36.00		

*Delivered.

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled nickel rods, Grade "A" (base)	45.00
Cold drawn nickel rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	28.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound, f.o.b. cars, depending on quantity:

	New York	Cleveland	Chicago
Crucible copper	13.75 @13.87½	13.75	12.75@13.25
Copper, heavy, and wire	13.12½@13.75	13.00	12.12½@12.50
Copper, light, and bottoms	11.62½@11.87½	11.00	11.00@11.50
Heavy lead	5.25 @ 5.37½	6.25	4.75@ 5.25
Tea lead	3.50 @ 4.00	4.25	3.75@ 4.25
Brass, heavy, yellow	7.62½@ 8.12½	8.50	8.00@ 8.50
Brass, heavy, red	10.50 @11.00	....	10.25@10.75
Brass, light	6.12½@ 6.62½	6.75	6.75@ 7.25
No. 1 yellow rod turnings	8.75 @ 9.25	9.50	8.75@ 9.25
Zinc	3.25 @ 3.50	3.25	3.00@ 3.50

TIN PLATES—Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—8-lb. Coating—Small lots—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.*	$0.10@0.13½	$0.16	$0.15
Cotton waste, colored, per lb.*	.09@ .13	.12	.12
Wiping cloths, washed white, per lb	.16@16½	38.00 per M	.17
Sal soda, per lb	.02	.02	.02
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, in 1 to 4 bbl. lots, per lb	.109	.11	.108
Cutting oil, about 25% lard, in 5 gal. cans, per gal	.65	.60	60
Machine oil, medium-bodied (55 gal. steel bbl.) per gal	.30	.36	.36
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin.ft per inch of width for single ply.:			
Medium grade	30–10%	30–10%	35%
Med. grade, heavy wgt.	30–5%	30–5%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin.ft.:			
First grade	50%	50–10%	50%
Second grade	60%	60–5%	50–10%

*All waste in bale lots.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0325	$0.0325	$0.0324
Cold drawn shafting	per lb.	.034	.034	.04
Brass rods	per lb.	.18	.175	.16
Solder (½ and ½)	per lb.	.3425	.34	.3625
Cotton waste, white	per lb.	.10@.13½	.10@.13½	.10@.13½
Disks, aluminum oxide mineral, cloth, No 1, 6-in. dia	per 100	3.59	3.05	3.10
Lard cutting oil	per gal.	.65	.65	.65
Machine oil	per gal.	.30	.30	.27
Belting, leather, medium	off list	30–10%	30–10%	35%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	50%*

*List prices as of April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
Flint paper	$4.05	$4.29	$4.29
Emery cloth	20.22	20.97	20.97
Disks, aluminum oxide mineral, 6 in. dia., No. 1, per 100:			
Paper	2.04	2.04	2.04
Cloth	3.59	3.59	3.59
Fire clay, per 100 lb. bag	1.00	.75	.75
Coke, prompt furnace, per net ton	Connellsville,		2.85@3.00
Coke, prompt foundry, per net ton	Connellsville,		4.00@4.50
White lead, dry or in oil	100 lb. kegs	New York,	13.25
Red lead, dry	100 lb. kegs	New York,	13.25
Red lead, in oil	100 lb. kegs	New York,	14.75

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Full Kegs or Cases
Machine bolts, square heads and nuts:	
Up to ¾ x 6-in.	55%
Larger up to 1 x 30-in.	50%
1¼ and 1½ in. dia.	35%
Carriage bolts:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Coach and lag screws:	
Up to ½ x 6-in.	55%
Larger sizes	50%
Tap bolts, hexagonal heads	40%
Nuts:	
Hot pressed, square and hexagonal, blank or tapped, up to 1-in., incl.	55%
Cold punched, square and hexagonal, blank or tapped, up to 1-in. incl.	55%
Semi-finished, hexagonal, tapped, in packages, all sizes	40%
Case hardened, hexagonal, tapped, in packages, all sizes	30%
Washers: Deduct from list, per 100 lb	$3.50*
Rivets, button and cone head:	
Small, including ⅞-in. dia	50–10%
Large (base) per 100 lb. net	$5.00†

Note—For less than full package quantities on bolts, screws, hot-pressed and cold-punched nuts, add extra of 10 per cent to list.
*Broken keg lots, $1.50 off list. †Broken keg lots, $6.50 net.

Machine Requirements and Industrial Construction

Equipment Wanted

Calif., San Francisco—Bd. of Public Works—will receive bids until Nov. 14 for additional mechanical equipment for boiler room, shop and academic departments of Polytechnic high school on Frederick St. $15,000.

Ill., Pearl—F. Barstith—14 to 20 in. x 4 ft. lathe with equipment.

Mass., Boston—Sombco Co., 601 Newbury St.—tool room or bench lathe, large capacity, hand or power miller and buffing machine. a

Mass., Concord—W. H. Trowbridge, 170 Virginia Rd.—air compressor for stone drilling, air hammer and drills.

Mich., Albion—Decker Screw Products Co., Clark St. and N. Y. C. Ry., V. E. Decker, Mgr.—machinery and equipment for the manufacture of screw products for proposed addition to factory.

Mich., Detroit — The Crane Co., 150 Randolph St.—machinery and equipment including crane, etc., for proposed 1 story, 50 x 230 ft. pipe shop and warehouse on St. Jean Ave. Estimated cost $50,000.

Mich., Detroit—Dept. of Public Works, City Hall—machine shop equipment (later) for proposed 1 story airplane hangar with machine shop, capacity of hangar 9 planes.

Mich., Detroit—Federal Mogul Corp., 11031 Shoemaker Ave.—equipment for manufacture of automobile bearings for proposed 1 story, 120 x 180 ft. bearing factory. Estimated cost $50,000.

Mich., Detroit—Michigan Steel Casting Co., Goin and St. Aubin Sts.—foundry equipment for making and finishing steel castings.

Mich., Detroit—Murray Corp. of America, 1424 Aberle St.—press shop equipment including crane, etc. for proposed 1 and 6 story, 250 x 425 and 350 x 525 ft. automobile body plant at Russel and Colby Sts.

Mich., Hamtramck (br. Detroit)—Dodge Bros., Div. of Chrysler Corp., 341 Massachusetts Ave., Highland Park—miscellaneous forge shop equipment for proposed 1 story blacksmith shop on Conant Rd. Estimated cost $50,000.

Mich., Highland Park (Detroit P. O.)—Wood Hydraulic & Body Co., 7924 Riopelle St., Detroit—machine shop equipment for proposed 1 story, 50 x 350 ft. truck body factory. Estimated cost $55,000.

Mich., Jackson—Jackson Motor Shaft Co., Tyson St. and M. C. R. R.—miscellaneous machine shop equipment for proposed 1 story, 50 x 270 ft. motor shaft factory. Estimated cost $45,000.

O., Canton—Hercules Motor Corp., 140 Halliwell Pl. S. E.—machinery and equipment to cost approximately $35,000 for proposed 1 story, 80 x 180 ft. factory unit.

O., Canton—Timken Roller Bearing Co., Dueber Ave. S. W.—machinery and equipment for the manufacture of roller bearings for proposed 1 story addition to factory at Park Ave. S. W. and Lawn Ave. S. W. Estimated cost $100,000.

Ont., Merritton—Hayes Wheel Co.—additional equipment for the manufacture of automobile wheels, to increase capacity of plant. Estimated cost $50,000.

Opportunities for Future Business

Calif., Berkeley—Hall-Scott Motor Co., 719 Pine St., awarded contract for a 1 story factory. Estimated cost $20,000.

Ill., Chicago—Stewart Warner Speedometer Co., 1828 Diversey Parkway, awarded contract for a 10 story, 88 x 103 ft. factory for the manufacture of automobile supplies, speedometers, bumpers, etc. at 2825 Lincoln St. Estimated cost $300,000.

Kan., Kansas City—E. E. Portersfield Jr., 2800 East 13th St., awarded contract for the construction of a 1 story, 100 x 300 ft. and 2 story, 30 x 70 ft. airplane factory.

Md., Baltimore—Crown Cork & Seal Co., awarded contract for a 1 and 2 story addition to plant. Estimated cost $400,000. Noted Oct. 25.

Md., Baltimore—J. E. Sperry, Calvert Bldg., Archt., is preparing plans for a 6 story garage at Mulberry and State Sts. Estimated cost $500,000. H. F. Doeleman, 516 North Charles St., Engr. Owners' name withheld.

Md., Baltimore—A. Weiskittel & Son Co., 12th and Lombard Sts., stove manufacturers, plans a 1 story 83 x 110 ft. addition to plant. Estimated cost $12,000.

Mass., Cambridge (Boston P. O.)—Blanchard Machine Co., 64 State St., is having preliminary plans prepared for a 1 story, 90 x 100 ft. machine shop at Osborn and Smart Sts. C. T. Main, 201 Devonshire St., Boston, Engr.

Mich., Detroit—Chrysler Corp., 341 Massachusetts Ave., Highland Park, awarded contract for a 1 story, 160 x 180 ft. machine shop on East Jefferson Ave., here.

Mich., Detroit — Hudson Motor Car Co., 12601 Jefferson Ave., awarded contract for 2 story, 80 x 345 ft. addition to automobile factory.

Mich., Detroit—Packard Motor Car Co., 1580 East Grand Blvd., is having plans prepared for a 2 story, 130 x 380 ft. car storage building on East Grand Blvd. Estimated cost $150,000. A. Kahn, 1000 Marquette Bldg., Archt.

Mich., Pontiac—Oakland Motor Car Co., Oakland Ave., had plans prepared for a 2 story, 45 x 100 ft., addition to automobile plant. Estimated cost $50,000. A. Kahn, 1000 Marquette Bldg., Archt.

Mo., Carthage—Morrow-Kidder Mfg. Co., is having preliminary plans prepared for the construction of a planing mill. Estimated cost $75,000.

N. J., Elizabeth — American Gas Acculator Co., Newark Ave., will soon award contract for a 1 story, 60 x 140 ft. factory. Estimated cost $40,000. W. L. Fenne, 91 Broad St., Archt.

N. J., Jersey City—Liberty Auto Radiator Co., 3218 Boulevard, is having plans prepared for a 2 story factory and repair shop. Estimated cost $40,000. Flagg & Stades, 665 Newark Ave., Archts. Noted Nov. 1.

N. J., Newark—Clinton St. Garage Inc., 247 Market St., will build a 7 story, 55 x 120 ft. garage at 65-67 Clinton St. Estimated cost $200,000. G. Jones, 24 Commerce St., Archt. Noted Aug. 9.

N. J., Paterson—R. Atkins, 411 East 41st St., awarded contract for a 1 story, 155 x 200 ft. garage on Park Ave. Estimated cost $150,000. Noted Oct. 4.

N. Y., Brooklyn—Dept. of Mental Hygiene, Albany, received lowest bid for the construction of a shop building, etc. at Brooklyn State Hospital here from Balaban-Gordon Co. Inc., 116 West 39th St., New York, $71,720.

N. Y., Brooklyn—National Lead Co., E. J. Carnish, Pres., 111 Broadway, New York, plans the construction of a 122 x 172 ft. factory at Marshall and Gold Sts. Estimated cost $225,000. W. Higginson, 101 Park Ave., Archt.

N. Y., Brooklyn—J. Reilly, Bergen St. and 6th Ave., plans the construction of a 2 story, 60 x 131 ft. garage. Estimated cost $90,000. H. E. Magnuson, 420 Lexington Ave., New York, Archt.

N. Y., Brooklyn—L. Sarkin, 1744 East First St., will build a 2 story, 70 x 196 ft. garage at Prospect and 6th Aves. Estimated cost $60,000. Cohn Bros., 361 Stone Ave., Archts. Noted Oct. 4.

N. Y., Brooklyn—Sherwood Holding Corp., L. Rothstein, Pres., c/o A. Nurick, 66 Court St., Archt., plans the construction of a 45 x 95 ft. garage at 7th Ave. and Union St. Estimated cost $70,000.

N. Y., Brooklyn — Weisbraun Realty Corp., S. Braun, Pres., 435 Beach 36th St., Edgemere, L. I., will build a 1 story, 150 x 175 ft. garage at Erasmus St. here. Estimated cost $70,000. H. J. Nurick, 44 Court St., Archt. Noted Oct. 4.

N. Y., Brooklyn—Weihl Bros., 971 Grand St., plans the construction of a 57 x 122 ft., foundry at Grand St. and Morgan Ave. Estimated cost $20,000. T. Goldstone, 26 Court St., Archt.

N. Y., New York — H. Bernstein, 11 Trinity Pl., New Rochelle, plans a 2 story, 99 x 100 ft. garage at Cromwell Ave. and 170th St. Estimated cost $55,000. J. J. Gloster, 1440 Broadway, Archt.

N. Y., New York—Dwight P. Robinson Co. Inc., 125 East 46th St., plans a 9 story, 125 x 200 ft. garage at 205 East 64th St. Estimated cost $500,000. Private plans.

N. Y., New York—Tadpole Building Co., W. Steinman, Pres., 101 Park Ave., plans a 6 story, 88 x 120 ft. garage at 234 East 85th St. Estimated cost $100,000. M. J. Ort, 424 East 149th St., Archt.

O., Alliance — Alliance Aircraft Corp., awarded contract for a 1 story, 60 x 300 ft. airplane factory on North Webb Ave. Estimated cost $40,000.

O., Canton—Canton Drop Forging & Mfg. Co., 300 Odd Row Pl. S.E. plans the construction of a 1 story, 70 x 320 ft. factory on Harrison Ave. S.W. Estimated cost $100,000.

O., Canton — Timken Sheet & Tube Co., will soon award contract for a 2 story, 42 x 100 ft. laboratory building at Harrison Ave. S. W. Estimated cost $40,000.

O., Cincinnati—Cincinnati Grinders Inc., South Oakley St., awarded contract for a 1 story factory on Forrer St. Estimated cost $45,000.

O., Cleveland—Atlas Foundry Co., J. H. Bruce, Pres., West 69th St. and W. & L. E. R.R., awarded contract for a 1 story, 30 x 90 ft. addition to foundry. Estimated cost $40,000. Noted Nov. 1.

O., Cleveland—C. B. Dawsin, 3106 East 63rd St., (iron steel and wire) will build a 1 story, 46 x 92 ft. addition to factory. Estimated cost $40,000. Private plans.

O., Cleveland—Hanna Garage Co., A. A. Kerr, Pres., 1741 East 12th St., awarded contract for a 3 story, 130 x 132 ft. addition to garage. Estimated cost $200,000.

O., Cleveland—Huron Road Garage Co., c/o A. Sogg, 3030 Euclid Ave., Archt., is having plans prepared for a 3 story, 80 x 128 ft. garage on Huron Rd. Estimated cost $150,000.

O., Cleveland — Midland Steel Products Co., E. J. Kulas, Pres., West 106th St. and Madison Ave., awarded contract for a 1 story, 80 x 120 ft. laboratory on West 106th St. and Madison Ave. Estimated cost $75,000.

O., Cleveland — Precision Castings Co., J. W. Millspaugh, Local Rep. Keith Bldg., awarded contract for a 1 story factory on Berea Rd. Estimated cost $75,000.

O., Cleveland—Taylor-Lockwood Co., G. E. Collings, Pres., 2224 Clarkwood Rd., (wood reclaimers) awarded contract for a 3 story, 48 x 64 ft. factory. Estimated cost $40,000.

O., Wooster — McIntosh Hemphill Co., Oliver Bldg., Pittsburgh, Pa., is receiving bids for a 1 story, 100 x 328 ft. addition to foundry, here. Estimated cost $150,000. Private plans.

Okla., Tulsa—Greenlease-Moore Cadillac Co., awarded contract for a 4 story, 100 x 140 ft. automobile sales and service building. Estimated cost $150,000.

Pa., Philadelphia—Atwater Kent Mfg. Co., 4700 Wissahickon Ave., manufacturers of radios, will soon receive bids for addition to factory. Estimated cost $1,000,000. Ballinger Co., 105 East 128th St., Archt.